Profitability of Insider Trading in Europe: A Performance Evaluation Approach[*]

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Abstract

We use the largest cross-country sample of reported share transactions by corporate insiders to date to establish that insiders in the majority of European countries do not make statistically significant abnormal trading profits. This finding stands in contrast to the earlier evidence from the U.S. The result holds across subsamples of firms with different characteristics. Furthermore, the introduction of the European Union Market Abuse Directive (MAD) had a mixed impact on the frequency and volume of insider trading across countries but generally did not affect profits of insider-mimicking portfolios. We build on the heterogeneity of our sample countries to show that several country-level regulatory, economic and cultural factors are linked with the level of insider profits which can explain why the profitability of insider trading differs starkly across countries.

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1. Introduction

There is major controversy around profits corporate insiders can make from trading in their firms' shares. By the nature of their jobs, insiders have privileged access to non-public information and, if they use that information in trading, they are likely to benefit at the expense of uninformed outside investors. While some argue that profits from insider trading are a form of compensation for managers (Manne, 1966; Carlton and Fischel, 1983) and that insider trading can bring potential welfare benefits for the whole society from more informationally efficient stock pricing (Manne, 1966; Leland, 1992), others point to flawed incentives insider trading creates and to a negative impact of insider profits on outside investors (e.g., Ausubel, 1990; Leland, 1992; Fried, 1998; Bebchuk and Fried, 2003). Regulators around the world focus on the harmful adverse selection effects of insider trading and take a clear stance by prohibiting trading on the basis of material nonpublic information, aiming to curb trading profits insiders can obtain. In this paper we use a data set of reported share transactions by corporate insiders in 18 European countries covering up to 14 years, the largest cross-country sample to date, to provide the first thorough exploratory analysis of the performance of insider-mimicking portfolios in Europe. We find that insiders in many countries across Europe, and particularly continental Europe, do not earn abnormal profits from their trades.

This paper closely follows the setup in Jeng et al. (2003) who study profitability of corporate insider trading in the U.S. They find that a portfolio mimicking insider purchase transactions outperforms the CAPM model by 68 basis points and the four-factor model by 52 basis points per month (more than 8 and 6 per cent per year, respectively), while the sale portfolio does not earn significant abnormal returns. Data on insider transactions across Europe became available only recently, with many countries introducing mandatory reporting of trades by corporate insiders throughout the 2000s. Our aim, hence, is to apply the

methodology in Jeng et al. (2003) to new European data to provide a unified picture of insider trading profitability across Europe, compare it with the U.S. evidence in Jeng et al. (2003) and shed more light on the question of whether country-level factors determine the profitability of insider trades.[1]

Following the approach in Jeng et al. (2003), we analyze purchase portfolios that consist of all shares bought by insiders in a given country and held over a specific period of time, and sale portfolios that consist of all shares sold. We then estimate whether such mimicking portfolios outperform the respective market on the risk-adjusted basis. As noted by Jeng et al. (2003), it is impossible to determine actual insider trading profits because information on stock holding periods is incomplete. For example, there is no information on an individual's trades before she becomes an insider (i.e., takes a position in the firm which requires reporting of trades under insider trading rules) or after she ceases being an insider. Hence, it is impossible to determine when all individual stock positions are opened or closed. Additionally, information on shares acquired in an equity-based compensation scheme over the individual's career can be imperfect or incomplete. Because of these data limitations, one has to rely on a proxy for insider returns based on an assumption about the holding period; hence, this approach measures *realizable* and not *actual* returns. Jeng et al. (2003) assume a six-month holding period consistent with the short swing trading rule in the U.S. that effectively bans round-trip share transactions by corporate insiders in a period shorter than six months. Because to the best of our knowledge there is no equivalent of the short-swing trading rule in Europe, we choose different holding periods and look at horizons of 1, 3, 6 and 12 months.

Our results can be summarized as follows. We find that insider portfolios generate significant risk-adjusted abnormal returns, α's, in only few European countries. For both

[1] In a related study, Eckbo and Smith (1998) apply an alternative time-varying expected return framework to analyze insider portfolios in Norway and fail to find any abnormal performance.

purchases and sales we find evidence of the average profitability decreasing with the holding horizon, indicating the short-lived nature of insider information advantage. The results are similar across sub-samples of firms with specific characteristics related to transparency (size, analyst coverage and industry classification and ownership structure), indicating that there is no group of firms in which insider trading is consistently profitable. We also find that the introduction of the European Union Market Abuse Directive (MAD) into local laws changed insiders' trading patterns, with a mixed picture across countries: insiders post-MAD trade more frequently but in lower quantities or trade with the same frequency but in larger quantities per trade, but overall the introduction of the MAD had no systematic significant effect on returns generated by insider portfolios.

Differences in insider trading profitability between our sample countries and also the stark contrast between the, on average, low profitability in Europe compared to the U.S. indicate that structural differences between countries can affect insider profits. In an attempt to shed light on those differences we run further cross-sectional tests in which we regress α's to insider portfolios in individual countries on a number of regulatory, economic and cultural country-level factors. We find some evidence that insider trading profits are linked with the overall investor protection, trading costs, religiosity, trade reporting deadlines and the strictness and enforcement of insider trading rules in the country. Specifically, we find that insider buying is more profitable in countries with stronger investor protection, in less religious countries and when trade reporting deadlines are longer, and the profitability is also positively linked with trading costs. For sale transactions, our results indicate that insider trading is less profitable in countries with more stringent and better enforced MAD rules. Overall, our findings of the importance of country-level factors for insider profits potentially explain why the profitability of insider trading is likely to differ significantly across countries.

This study complements papers that analyze abnormal stock returns following insider transactions using the event-study methodology in individual countries (e.g. Friederich et al., 2002; Fidrmuc et al., 2006; Betzer and Theissen, 2009; Ravina and Sapienza, 2010; Gregory et al., 2013) or in multi-country samples (Ausenegg and Ranzi, 2008; Dardas and Guettler, 2011; Fidrmuc et al., 2013). As noted by Jeng et al. (2003), the event study methodology is best-suited to answer a question of how informative insider trades are for future returns but it fails to address a complementary question of returns earned by corporate insiders from trading. Towards that end, the approach applied in this paper to analyze portfolios mimicking all insider transactions in a country over time has several advantages. It implicitly accounts for the transaction volume and, hence, is closer in reflecting the actual insider portfolio as opposed to equal weighting of transactions in event studies. It is also focused on observing a time series of insider portfolio composition and performance, including a sequence of trades within a company and across companies, as opposed to the cross-sectional approach in event studies. Therefore, the performance evaluation approach employed in this study helps to deal with the problem of cross-sectional dependence across trades that hampers statistical inferences about the average abnormal performance in event studies.

The remainder of this paper is organized as follows. Section 2 compares key characteristics of regulations of insider trading and reporting of insider trades in Europe. Section 3 presents data on insider transactions used in this paper and Section 4 introduces the methodology. Section 5 presents and discusses empirical results on the profitability of insider trading in Europe, including a battery of robustness checks, tests in subsamples and the impact of the MAD on insider profits. Section 6 explores cross-country determinants of the profitability of insider trading, and Section 7 concludes the paper.

2. Review of Insider Trading Regulations[2]

At the country level, transactions by corporate insiders are subject to legal rules and further regulations imposed by stock exchanges or stock market regulators. As documented by Bhattacharya and Daouk (2002), laws prohibiting trading on undisclosed price-sensitive information exist in all developed markets and in the majority of emerging markets but their wide-spread introduction is only a phenomenon of the 1990s. In the European Economic Area (E.E.A.), of which all of our sample countries except for Switzerland are members[3], national insider trading regulatory frameworks now follow the European Union (E.U.) Market Abuse Directive (MAD). The MAD – Directive 2003/6/EC – aims to develop and unify regulations across E.E.A. member states to curb insider trading and market manipulation as two forms of market abuse to ensure integrity of financial markets and to enhance investor confidence in financial markets. The MAD was introduced in 2003 and was enacted in legislations of individual E.E.A. countries between April 2004 and January 2007 (Christensen et al., 2016).

Regarding the reporting of transaction by corporate insiders, the MAD specifies that individuals who discharge managerial responsibilities must notify relevant authorities of their transactions in their firms' securities, and that such information should be made publically available. The requirement of public announcements of insider transactions was new to some countries but there were E.U. countries (for example, the U.K, Germany or the Netherlands) in which insider transactions were reported before the MAD. The aim of the MAD was to develop unified regulations across Europe.

[2] This section outlines regulations in place at the end of the sample period of this paper (December 2012), relevant for the analysis of empirical results. In 2016 the regulations across the European Economic Area (E.E.A.) were replaced by the new European Union (E.U.) Market Abuse Regulation (MAR).

[3] The majority of our sample countries are members the E.U. and hence E.E.A. Iceland and Norway are not members of the E.U. but they adopted the E.U. capital markets directives, including the MAD, as members of the E.E.A. Switzerland is neither an E.U. nor E.E.A. member and therefore did not adopt the E.U. directives.

A follow-up Directive 2004/72/EC focuses on specific implementation of the MAD related to, among others, notification of insiders' transactions. It specifies that corporate insiders obliged to report their transactions include members of the administrative, management or supervisory bodies of the firm or senior executives who are not members of those bodies but who have regular access to inside information. The reporting of the transaction should be made within five working days of the transaction date. The directive also allows the E.E.A. member states to exempt from reporting small trades, defined as trades with the total value of less than EUR 5,000 within a calendar year.

Individual stock market authorities can introduce stricter reporting rules or rules in areas not covered by the directives. One example of such areas are the so called 'closed periods' during which corporate insiders are not allowed to trade at all. If closed periods are introduced, they are normally associated with earnings announcements before which insiders are assumed to have the largest information advantaged compared to the general public.[4]

Table 1 summarizes key characteristics of regulations related to trading and trade reporting by corporate insiders across our sample countries. These characteristics include reporting deadlines, exclusions from reporting requirements and any closed periods introduced at the country level. They have a potential impact on insider trading returns this paper analyzes. Insiders can trade more strategically if they can delay reporting (e.g., Betzer and Theissen, 2010; Betzer et al., 2015), and closed periods potentially limit insiders' profits by restricting trading when insiders have a large information advantage (e.g., Betzer and Theissen, 2009).

As indicated in the table, all countries allow at most 5 working days for reporting of share transactions, in line with the E.U. directives. Nine of the sample countries introduced a stricter deadline and accelerated reporting, ranging from immediate disclosure to the deadline

[4] The E.U. Market Abuse Regulation (MAR) enacted in 2016 introduced mandatory closed periods throughout the E.E.A. countries.

of four working days. Those countries include Switzerland which does not adopt the E.U. directives. Interestingly, Iceland and the Netherlands apply selective deadlines requiring top executives to report their trades immediately, sooner than other insiders. Nine countries adopted the exemption of reporting of small trades, as guided by the Directive 2004/72/EC, and Switzerland introduced a higher threshold for trades which are made public by the SIX Swiss Exchange – transactions that total less than CHF 100,000 in a calendar month, even though reported by insiders to the exchange, are not published.

Seven countries introduced mandatory closed periods in which insiders must not trade. These are either fixed closed periods at the country level in Estonia, France, Ireland, Sweden and the U.K., or requirements of closed periods at the firm level in Denmark and the Netherlands. The closed periods have different lengths across countries. For example, in France insiders are not allowed to trade in the period of 15 days before earnings announcements, in Sweden the closed period is 30 days long, and in Ireland and the U.K. it is as long as 60 days before the publication of annual results. Furthermore, Iceland recommends firms to introduce closed periods but there is no strict requirement, and even though in Switzerland there is no mandated closed periods, insiders are advised not to trade 20 days before earnings announcements.

3. Insider Trading Data

Data on reported insider transactions are sourced from Directors Deals Ltd (www.directorsdeals.com). The sample includes countries with insider trading data covering at least 5 years and all data series run until the end of 2012. The data set identifies the name and position of the insider, firm identifiers, date of the transaction, type of the transaction, the security involved, and transaction price and volume. Similarly to the standard approach in the literature (e.g., Lakonishok and Lee, 2001; Jeng et al., 2003), we focus on open-market

purchase and sale transactions in shares, and exclude share grants, transfers and option exercises. The rationale is to focus on transactions initiated by insiders, in which they have discretion regarding the timing and volume of trading. Data provided by Directors Deals Ltd contain transactions with a value of at least GBP 10,000 (or equivalent in the local currency).

Details of data coverage are presented in Table 2. The full sample contains over 166,000 transactions, split between over 99,000 purchases and 67,000 sales. Starting months for individual countries differ and are mainly driven by different introduction dates of national insider trading rules that made reporting of insider transactions mandatory. The longest series covering 14 years are available for Ireland and the U.K., while Greece has the shortest coverage of 5 years (countries with even shorter histories of data were excluded from the analysis). The average number of transactions per month varies mainly with the market size. The largest number of purchases per month is observed for France, Germany, Greece and the U.K., while the largest number of sales is recorded for France, Germany, Italy and the U.K. Not surprisingly, small stock markets of Estonia, Iceland and Latvia have the smallest number of trades. For only three countries (Belgium, the Netherlands and Switzerland) the number of insider sale transactions is greater that the number of purchase transactions. However, sale transactions tend to be larger and hence the average volume of sales per month is larger than the volume of purchases in 13 out of the 18 sample countries. The only countries in which insiders, on average, buy more shares than sell are Greece, Ireland, Latvia, Lithuania and the Netherlands. Insiders sell more than buy in response to equity-based compensation when they rebalance their portfolios or gain liquidity following stock or option grants and exercises. Fernandes et al. (2013) show that even though the importance of equity-based compensation in Europe is lower than in the U.S., still the equity incentive pay in European companies typically accounts for more than 10% of the average CEO pay package.

4. Performance Evaluation Methodology

The methodology of our empirical analysis closely follows the approach initially proposed by Jeng et al. (2003). We build portfolios that mimic separately all insider purchases and sales in a given country, with purchase (sale) portfolios created by adding to a hypothetical portfolio all shares purchased (sold) by insiders on any given day and holding them over a specified period. Similarly to Jeng et al. (2003), we consider closing prices on the reported transaction dates as prices at which stocks are added to the mimicking portfolios. We choose to focus on four different holding horizons: 20, 65, 130, 260 trading days, which is equivalent to approximately 1, 3, 6 and 12 calendar months, to observe how realizable returns to insider portfolios behave over time. As a result, a purchase (sale) portfolio with, for example, the 20-day holding period contains all shares purchased (sold) by insiders in a given country over the previous 20 trading days. Based on portfolio constituents each day, we calculate value-weighted daily portfolio returns using data on closing prices and total daily returns on individual stocks, both sourced from Datastream. All calculations are done in local currencies to avoid the results being influenced by exchange rate movements. If a portfolio is empty on a given day, which may happen for small markets with a short assumed holding period, the portfolio return on that day is set to zero.[5] Daily portfolio returns are then compounded to monthly returns for each calendar month in the sample period. We analyze performance of insider portfolios using monthly returns as they are less noisy than daily ones.

The performance of insider portfolios is benchmarked against the one-factor model:

$$R_{pt,i} - R_{ft,i} = \alpha_i + \beta_i \, RMRF_{t,i} + \varepsilon_{pt,i}, \quad (1)$$

where $R_{pt,i}$ is the return on the insider portfolio in month t and country i, $R_{ft,i}$ is the risk-free rate in month t and country i, and $RMRF_{t,i}$ is the month t's excess return on the stock market

[5] Because empty sets on specific days can bias our results against finding significant outperformance, as a robustness check we also repeat the analysis for the countries with the largest number of listed stocks which are less likely to be affected by this problem. See the end of this Section for details.

in country *i* over the risk free rate in that country. We use the local three-month interbank rate as a proxy for the risk-free rate in each country, and three-month Euribor is used for countries in the Euro area. MSCI total return indices (in local currencies) proxy for stock market portfolios in all countries except for Iceland, Latvia and Lithuania for which MSCI indices are not available and local OMX price indices are used instead. The interbank rates and index data are collected from Datastream. α_i is the portfolio's Jensen's α and it measures the monthly risk-adjusted return on the portfolio. Statistically significant insider trading returns to purchase portfolios will be reflected in significant positive α's, while returns to sale portfolios will be reflected in negative α's, indicating avoided losses. To make the results fully comparable across countries, all baseline tests are estimated for trades in a unified window of 2008 to 2012.

In addition to the baseline tests, we perform a few checks to test if the results are robust to the choice of the estimation method, sample composition and sample period. We start with addressing the problem of the possible bias in β estimates due to thin trading (Scholes and Williams, 1977; Dimson, 1979). We address this issue in three different ways. First, we estimate simple market-adjusted returns of insider portfolios by restricting β_i in model (1) to one. The test answers the question of whether insiders beat their respective market, without any possibly imperfect risk adjustment of returns. Second, we extend model (1) to include the lagged excess market return[6]:

$$R_{pt,i} - R_{ft,i} = \alpha_i + \beta_{1i}\, RMRF_{t,i} + \beta_{2i}\, RMRF_{t-1,i} + \varepsilon_{pt,i}, \quad (2)$$

with all notation as in model (1). Third, we exclude from the analysis countries with the smallest number of listed firms. Those countries are likely to have least liquid stock markets and insider portfolios replicated for those countries are also more likely to be empty on some days, or contain few stocks. Here, we drop countries with fewer than 100 stocks traded on the

[6] See Ritter and Welch (2002) for application of such a model to test performance of a portfolio of IPO firms.

stock market throughout the sample period, as reported in the World Bank World Development Indicators (WDI). This requirement limits the sample to 12 countries. The excluded countries are the Czech Republic, Estonia, Iceland, Ireland, Latvia and Lithuania. As presented in Table 2, these are also the countries with the six smallest average numbers of insider transactions per month which corroborates the expectation that the exclusion will limit the number of countries with insider portfolios containing few stocks or, in the extreme, being empty.[7]

As a supplementary test of the performance of insider portfolios we also use an alternative, four-factor benchmark model of Carhart (1997):

$$R_{pt,i} - R_{ft,i} = \alpha_i + \beta_{1i} RMRF_{t,i} + \beta_{2i} SMB_{t,i} + \beta_{3i} HML_{t,i} + \beta_{4i} MOM_{t,i} + \varepsilon_{pt,i}, \quad (3)$$

where $SMB_{t,i}$ stands for month t's return on a portfolio of small firms less the return on a portfolio of large firms in country i, $HML_{t,i}$ stands for month t's return on a portfolio of high book-to-market firms less the return on a portfolio of low book-to-market firms in country i, and $MOM_{t,i}$ stands for month t's return on a portfolio of past 'winners' less the return on a portfolio of past 'losers' in country i. Data on factor returns is obtained from AQR website[8], and the factors are constructed as in Asness and Frazzini (2013) and Asness et al. (2014). They are available for 13 countries in our sample.[9] Factor returns from AQR are calculated in U.S. dollars and for consistency with all other tests in the paper we convert them to local currencies using data on exchange rates sourced from Datastream. In contrast to Jeng et al. (2003), we employ the four-factor model only as a supplementary check given the mixed evidence on the performance of three- and four-factor models in Europe.[10]

[7] Detailed estimation results of the baseline model reported in Appendix A and B reveal that the six countries filtered out using this approach are the only countries in the sample for which monthly aggregation yields at least one month with an empty portfolio throughout.
[8] https://www.aqr.com/library/data-sets
[9] The data is unavailable for the Czech Republic, Estonia, Iceland, Latvia and Lithuania.
[10] E.g., Fletcher (2001), Bauer et al. (2010), Fama and French (2012), Artmann et al. (2012), Gregory et al. (2013). Additionally, the problem of determining breakpoints for benchmark portfolios reduces the applicability

In addition to the baseline tests covering the 2008-2012 period for each country, we perform two further robustness checks by varying the sample period. First, we exclude from the analysis year 2008 to assess if the results change when we focus only on the post-crisis 2009-2012 period.[11] Second, we estimate α's of insider portfolios using all available observations for each country, as reported in Table 2. The estimation window is no longer unified but the approach allows us to increase the statistical power of our tests by increasing the number of monthly observations where available. The two tests in different sample windows also shed light on the stability of insider performance over time.

5. Profits to Insider Trading in Europe

5.1. Baseline Empirical Tests

This section provides evidence on the profitably of insider trading in Europe in the period 2008-2012, with the focus on the number of countries in which portfolios that mimic insider trades generate statistically significant α's.[12] As presented in Panel A of Table 3, α's of portfolios mimicking purchase transactions are significantly positive only in three countries and for the shortest, 20-day holding period. Those countries are the U.K. (α of 3.71%, 54.8% annualized), Germany (α of 2.73%, 38.2% annualized) and Norway (α of 2.64%, 36.7% annualized).[13] For other horizons, α's are insignificant, with the exception of one negative α for the 65-day horizon. For sell transactions (Panel B of Table 3), there is only

of the four-factor model in European countries (e.g., Dimson et al., 2003; Gregory et al., 2003). See Michou et al. (2014) for a comprehensive review of alternative approaches to estimation of risk factors.

[11] In the literature there is no agreement on the exact timing of the 2007-2008 financial crisis. Dungey et al. (2015) scrutinize 24 papers and reveal a wide disagreement regarding the starting and the end-date of that crisis episode: the beginning of the crisis is generally assumed to have occurred between January and August 2007, and the end-dates vary between January 2008 (for the subprime crisis) and July 2010. Four papers are reported to set the crisis end-date as December 2008, as we do, while further seven studies assume the crisis to have ended before that date. Dungey et al. (2015) themselves estimate the crisis dates endogenously and date the end of the first phase on October 5, 2008 and of the second, final phase on May 15, 2009. Hence, our decision to regard the 2009-2012 period as a post crisis era fits well into the existing literature.

[12] Throughout the paper, results are denoted as statistically significant if the p-value of the respective significance test is lower or equal to 5 percent.

[13] Full estimation results of the baseline model for individual countries are presented in Appendix A (purchases) and Appendix B (sales).

one significantly negative α for the 65-day horizon (Norway with α of -1.74%, -19.0% annualized) and one for the longest, 260-day holding period (Denmark with α of -1.44%, -16.0% annualized). Interestingly, for longer holding periods some α's of sale portfolios are significantly positive. Overall, the results indicate that insiders in only few European countries generate significant realizable returns when trading shares in their firms.

The average α for purchases over the 20-day horizon is 1.01% (12.8% annualized). It goes down over longer horizons but for the longest, 260-day holding period it edges higher to 0.41% (5.0% annualized). Similarly, the average profitability of sale portfolios decreases with the holding horizon, from the average 20-day α of -0.33% (avoided monthly losses of 33 basis points) to positive 0.37% for the 260-day holding period indicating unprofitable selling before share price increases. Decreasing realizable insider trading profits for both purchases and sales indicate that insiders' information advantage is short-lived. Jeng et al. (2003) find a similar trend for U.S. insiders. They document that as much as one quarter of insider profits come in the first five days and about a half come in the first month. Beyond the first month, the abnormal performance is much weaker.

Our results for the 130 trading-day holding period (approximately 6 months) can be compared with the results in Jeng et al. (2003) for the U.S. market. Jeng et al. (2003) find that the U.S. insider purchase portfolio outperforms the CAPM benchmark by statistically significant 68 basis points per month, and their α for the sale portfolio is insignificant with the point estimate of -17 basis points per month. Our estimates are on average lower with few of them statistically significant. Our mean (median) α of the purchase portfolio is 21 basis points (37 basis points). Our mean point estimate of α of the sale portfolio is -1 basis point, with the median of -9 basis points. When comparing the results, a possible concern is that the lower significance level of our estimates is driven by a smaller number of monthly return observations compared to Jeng et al. (2003), as smaller samples suffer from the reduced

power of tests. The insider transaction data set in Jeng et al. (2003) covers over 21 years, while our data for the baseline tests reported in Table 3 spans five years. To address this concern, in unreported tests we re-run regression (1) with all monthly observations pooled across our sample countries, with standard errors clustered two-way by country and month. The results are qualitatively and quantitatively similar to results in Table 3. For the 130-day holding period, α of the purchase portfolio is 20 basis points per month (p-value of 0.51), and for the sale portfolio it is -8 basis points (p-value of 0.81). Another concern is a possible trend in profitability of insider trading over time driven by changing regulations and/or detection or enforcement methods. The data set used in Jeng et al. (2003) runs until 1996 while our European data set covers a much more recent period. However, Lee et al. (2014) document that despite changes in regulations and a larger fraction of firms adopting internal insider trading policies over their 1986-2010 sample period, U.S. insiders continue to profit from purchase transactions but are more cautious when selling on negative private information. Furthermore, in Section 5.4 below we show that the results in our sample are also stable over time. Altogether, the differences in point estimates between our results and the results in Jeng et al. (2003), as well as the variability of α's across countries within our sample, suggest that country-level factors have an impact on trading performance of corporate insiders.

The low estimated profitability of insider trading in Europe could potentially also be an effect of an estimation bias when individual stock markets are illiquid and, additionally, insiders do not trade frequently, leading to empty insider portfolios. We find that the problem of empty mimicking portfolios affects to some extent six sample countries[14] (the Czech Republic, Estonia, Iceland, Ireland, Latvia and Lithuania) which have at least one month in the sample when the mimicking portfolio is empty throughout. However, the problem is

[14] See Appendices A and B for details.

potentially severe only in Latvia for portfolios with the short holding period. We address the concern of biased results in a comprehensive way in the following section.

5.2. Robustness Checks

We perform a battery of checks to test if the results presented in the previous section are robust to the choice of the estimation method, sample composition and the choice of the sample period.

Robustness tests for purchase transactions are reported in Panel A of Table 4. As discussed in Section 4, three of these tests, reported in Panels A1 to A3, address the possible bias in results due to biased β estimates in markets with thin trading and/or empty insider portfolios. In the robustness checks, the evidence of insider profitability over the shortest, 20-day holding period becomes somewhat stronger. When the CAPM β is restricted to one (Panel A1), or when the lagged market excess return is included (Panel A2)[15], α's are statistically significant in four countries as opposed to three countries in the baseline tests. α's for U.K., Germany and Norway remain significant in both scenarios, and they are joined by the α for Greece in tests with the β set to one and by the α for Ireland when the lagged market return is included. The mean α of purchase portfolios is also higher compared to baseline tests across holding horizons, with the exception for the longest, 260-day holding period. When the sample is restricted to 12 countries with the largest stock markets in our sample (Panel A3), the mean α goes up compared to the baseline tests for the shortest holding period but is reduced over longer horizons. Across all robustness tests, there is evidence of realizable returns decreasing with the holding horizon.

[15] In regressions for purchase transactions, the coefficient of the lagged excess market return is statistically significant for five countries for the 20-day holding period, five countries for the 65-day holding period, nine countries for the 130-day holding period and seven countries for the 260-day holding period. For sales, it is significant, respectively, in four, three, four and three countries.

The same robustness checks for sales portfolios are reported in Panels B1 to B3 of Table 4. The overall picture emerging from the baseline tests reported in the previous section is not altered and the robustness checks confirm that insiders do not sell shares in own companies profitably. There is a mix of significant positive and negative α's across tests and across horizons.

Taken together, given the evidence of the robustness of our findings to various approaches that are designed to address the potential problem of low market liquidity and infrequent insider trading, we can conclude that our key findings of low profitability of insider trading in Europe are not driven by potential estimation biases resulting from these phenomena.

As the one-factor CAPM model in equation (1) could fail to capture all relevant systematic risk factors affecting asset returns, we also employ the four-factors model for which the results are presented in Panels A4 (purchases) and B4 (sales). For purchases, the results are somewhat stronger compared to the single factor model. α is significant in 4 countries (Germany, Ireland, Norway and the U.K.) for the 20-day holding period, 2 countries (Belgium and the U.K.) for the 65-day holding period, one country (Belgium) for the 130-day holding period and 2 countries (Germany and Norway) for the longest, 260-day holding period. Still, in the majority of sample countries portfolios that mimic insider purchase transactions do not outperform the four-factor benchmark in a statistically significant way. Similar to all other tests, the mean α is highest for the short holding period of 20 trading days (1.54%, 20.1% annualized). Again, in line with other results, we fail to find significant outperformance of sale portfolios in results reported in Panel B4. If anything, we find some evidence of underperformance reflected in a few positive α's indicating insider selling ahead of price increases. Full estimation results for the four-factor models are not reported to save space but, overall, coefficients of the SMB factor are significant and all

positive for 18 of the 52 purchase portfolios (4 different holding periods across 13 countries) and for 10 of the 52 sales portfolios, indicating that, on average, insiders tend to trade in small firms. For the HML factor, there are 9 significantly negative and 2 significantly positive coefficients for purchase portfolios and 6 significantly negative and 1 significantly positive coefficients for sale portfolios. The loadings on the MOM factor are significant and all negative for 21 purchase portfolios, confirming that insiders are contrarians with their aggregate purchase portfolios tilted towards past losers (e.g., Jenter, 2005; Gregory et al., 2013). The results for sale portfolios are less clear-cut with 3 significantly positive and 7 significantly negative coefficients of the MOM factor.

Results presented in Panels A5 and B5 of Table 4 are estimated for a shorter sample period that excludes the year 2008, in which the results can be affected by the financial crisis of 2007-2008. For purchase transactions (Panel A5) and the 20-day holding period, α's of portfolios mimicking insider trades in Germany, Norway and the U.K., significant in the baseline tests, remain significant, but there are two further significant α's: in France and Greece. There is only one significant α for each of the remaining windows – in Norway (65-day holding period), Germany (130-day holding period) and Belgium (260-day holding period). Mean α's decrease with the holding period, and with the exception of the longest holding period are larger than in baseline tests reported in Table 3. For sale transactions (Panel B5), as in other tests of performance of insider sale portfolios, there is no evidence of significant outperformance of the benchmark.

Panels A6 and B6 report α's of insider portfolios using all available observations for each country. As sample periods differ across countries here, we lose the direct comparability of the results across countries but are able to fully exploit the largest cross-country sample of reported share transactions by corporate insiders to date. For purchase transactions (Panel A4), there is no substantial shift in the pattern of the average profitability compared to the

baseline tests reported in Table 3, but there is an increase in the number of statistically significant α's across all holding horizons. Five countries (U.K., Germany, Norway, Ireland and France) have significant α's for the 20-day holding period, two (U.K. and Ireland) for the 65-day holding period, two (U.K. and Estonia) for the 130-day holding period and one (U.K.) for the longest, 260-day holding period. The decreasing number of significant α's with the horizon, as well as the monotonically decreasing mean α, from 1.03% (13.1% annualized) for the 20-day holding period to 0.04% (0.5% annualized) for the 260-day holding period, confirm the overall picture of the short-lived nature of insider informational advantage. In line with this argument, α's in the U.K., significant for all holding periods, also reveal a monotonically decreasing trend, from 3.34% (48.3% annualized) for the 20-day holding period to 0.72% (9.0%) for the 260-day holding period. For sale portfolios, the tests that use all available observations for each country (Panel B6 of Table 4) reveal, again, the lack of conclusive evidence of the profitability of insider trading. There are both significantly positive and negative α's.

Overall, the comparison of the baseline results for the unified sample period of 2008-2012 (Table 3) and robustness test results using a shorter post-crisis period of 2009-2012 (Table 4, Panels A5 and B5) or all available transactions (Table 4, Panels A6 and B6) shows that the average profitability of insider trading (average α) varies slightly over time. However, we can rule out the possibility that the larger number of significant α's in the maximum window available for each country is purely driven by a higher statistical power due to the larger number of observations as we find a similar higher number of significant α's compared to the baseline tests for an even shorter window of 2009-2012. In Section 5.4 below we formally test, wherever data permits, for statistically significant trends or shifts in insider trading profitability over time, including the test of the impact the enactment of the Market Abuse Directive had on returns to insider portfolios.

Taken together, the battery of checks performed in this Section reveals that the overall picture emerging from the baseline tests holds – we fail to find evidence that insider-mimicking portfolios in Europe systematically beat their respective market benchmarks. α's in the vast majority of countries are insignificant, with any significant performance concentrated largely in the shortest holding period. The results vary somewhat with the estimation method or the sample period but overall we can conclude that the performance of insiders in Europe, and particularly in continental Europe, differs starkly from the one reported for U.S. insiders in Jeng et al. (2003).

5.3. Profits across Firms with Different Characteristics

To shed additional light on the profitability of insider trading in Europe we develop a set of further empirical tests. In this subsection we disaggregate the sample to test insider trading profits across firms with specific characteristics related to transparency. It is possible that while insider portfolios at the country level generate insignificant returns, subsamples of firms based on specific characteristics can offer significant profits to insider trading.

The underpinning argument is that insider trading profits are lower when insiders have a lower information advantage. We base on the premise that the information advantage is diminished with greater transparency, when more information becomes publically available and/or when specific ownership structures reduce insiders' information asymmetry through closer monitoring. Consequently, we test if the profitability of insider trading is lower in firms which are more transparent (larger firms, firms with analyst following and firms in traditional industries as opposed to high-tech firms) and in firms with concentrated holdings in which block holders closely monitor the firm. The earlier literature using U.S. data confirms that abnormal stock returns following insider transactions are higher in smaller firms and in firms with lower analyst coverage (e.g. Lakonishok and Lee, 2001; Frankel and

Li, 2004), and it is also documented that in the U.K. and Germany post-trade abnormal returns are lower in closely held companies (Fidrmuc et al., 2006; Betzer and Theissen, 2009).[16]

For a meaningful comparison we limit the analysis to 12 countries with at least 100 stocks traded on the stock market throughout the sample period, as reported in the World Bank World Development Indicators (WDI). Market capitalization data is taken from Datastream. Closely held shares are from Worldscope and are defined as the percentage of shares outstanding held by officers and directors, their immediate families, other individuals who hold more than 5 percent of shares, and other corporations. Both market capitalization and closely held shares are measured at the beginning of the year in which the trade took place. Analyst coverage is taken from IBES and is defined as the number of earnings forecasts in the month prior to the annual earnings announcement made in the year preceding the year of the trade. Industry classification is based on the 4-digit SIC code and high-tech firms are identified following Pagano et al. (2002). We form within-country groups every calendar year. We use the median market capitalization and median closely held shares calculated for all firms with at least one insider trade in the year in the given country to divide the firms in two groups, accordingly. Firms with a non-zero number of earnings estimates are classified as firms with analyst coverage, and as firms without analyst coverage otherwise.

The results are reported in Table 5, Panel A (purchases) and Panel B (sales). For this and subsequent tests, to save space, we report only results for the shortest, 20-day, and the

[16] As noted by Fidrmuc et al. (2006), concentrated holdings do not only proxy for the information asymmetry but can alternatively be interpreted from the perspective of the agency theory and incentive alignment and managerial entrenchment. Consistent with the agency argumentation, insider buying in firms with low ownership concentration increases the alignment of insiders' and outside shareholders' interests which is perceived as good news and hence increases share prices more than insider buying when ownership, and specifically insider ownership, is concentrated. With concentrated holdings, further purchases increase the entrenchment effect insulating insiders from disciplinary actions in the event of poor performance. Consequently, insider buying in firms with concentrated ownership is seen by the market as less positive news leading to a weaker stock price reaction.

longest, 260-day holding period.[17] Overall, there are few significant differences in insider trading profitability between groups and the results in sub-samples are similar to the full-sample results presented in earlier sections. In the majority of countries insider trading is unprofitable, with significant α's for selected purchase portfolios and mainly with the assumed shortest, 20-day holding horizon.

For both purchases and sales, there is some evidence that insider trading tends to be more profitable in firms with lower market capitalization (Panels A1 and B1), consistent with greater information advantage of corporate insiders in less transparent smaller firms. However, for purchases the difference is statistically insignificant and holds only for the short horizon, while it is consistent with the prediction for sales over both horizons but is significant only for the 260-day holding period. The difference in mean α's reaches 84 basis points for sales portfolios over the 260-day holding period.

In contrast to our expectations, insider purchase profits are larger in firms in traditional industries rather than in high-tech firms (Panel A3). Insider purchase profits are also somewhat larger, albeit insignificantly, in firms with a lower percentage of closely held shares (Panel A4). The difference in mean α's is 14-16 basis points. The sign of the difference is consistent with the hypothesis that closer monitoring by controlling shareholders diminishes the insiders' information advantage but the lack of statistical significance precludes any strong conclusions.

In summary, we can rule out the possibility that while, overall, insider trading in Europe tends to be unprofitable, there are subsamples based on firm characteristics in which there is evidence of consistently significant insider trading α's.

[17] Full results are available from the authors upon request.

5.4. The Impact of the Market Abuse Directive on Insider Profits

The comprehensive evidence presented so far reveals that insiders in few European countries trade profitably in their firms' shares. The majority of the tests were performed on data covering the period 2008-2012 when the MAD was in place in the sample countries. In this subsection we provide supplementary time series evidence to check if α's to insider portfolios change at the time when the MAD was introduced in individual countries. As outlined in Section 2, the MAD was designed to unify regulations across the E.U. countries and step up efforts to combat insider trading and market abuse in financial markets.

We start with presenting in Table 6 information on the number of insider transactions and trading volume before and after the MAD was enacted in the national legislation in five countries for which we have sufficiently long time series covering the pre- and post-MAD periods (Germany, Ireland, Italy, the Netherlands and the U.K.). For a better direct comparison, we trim series for each country to start in January 2003. The evidence clearly shows a significant increase in at least one of the measures across countries. The average monthly number of purchases increases significantly in four countries (all except the U.K.) but the average purchase volume goes significantly up in only one of them (Italy), indicating that insiders tend to buy shares more frequently but in lower quantities per trade. Similarly for sales, in Ireland and the U.K. the number of transactions goes significantly up with an insignificant change in the average monthly volume. On the other hand, in Germany, Italy and the Netherlands the sales volume goes significantly up but the average number of transactions does not change significantly which indicates that insiders in those countries do not sell shares more frequently but do so in larger quantities.

The results present a mixed picture of insiders trading after the MAD more frequently but in lower quantities or trading with the same frequency but in larger quantities. However, it is also possible that the stricter MAD rules did not change trading patterns but forced

insiders to report more transactions, or higher volumes of transactions, that otherwise were not reported in the pre-MAD period. We are not able to assess the scale of non-compliance with reporting regulations over time in our sample but Bajo et al. (2009) estimate that in Italy in 2003 (in the pre-MAD period) only 29.6% of insiders complied with regulations and fully reported their trading activity. Interestingly, our data for Italy reveal a sharp increase in the number of both purchases and sales and a sharp rise in the volume of sales in the post-MAD period. In fact, among the five countries analyzed, for Italy we observe the largest percentage increase in the number of purchases and the largest percentage increase in the sale volume, and the second largest increase in purchase volume.

We now turn to the analysis of the impact of the MAD on α's of insider portfolios. Introduction of the MAD can have two opposite effects on insider trading profits. On the one hand, if the MAD creates disincentives for corporate insiders to trade on inside information, then we should observe a decrease in the average profitability of insider trading around and following the enactment of the MAD. On the other hand, if the MAD increases market cleanliness by reducing insider trading across the market, those insiders who do continue to trade on inside information under the MAD could be able to obtain higher profits. Such an undesirable consequence of insider trading regulations is documented by Bris (2005), who finds that profits to trading on inside information ahead of acquisition announcements increase rather than decrease after the initial enforcement of insider trading laws in a country. In other words, discouraging widespread trading on inside information can create monopoly profits for those who still decide to trade.[18] Even though Bris (2005) looks at unreported trades, the argument can be translated to the context of this paper – with less information incorporated in stock prices by informed traders, there is a larger scope for profits for those who trade on private information, no matter whether those informed trades are disclosed or

[18] The argument is related to the observation in Admati and Pfleiderer (1988) that more insiders compete away insider profits.

not. In a related study, Griffin et al. (2011) find that stock prices move less on public information announcement when (undisclosed) insider trading is more prevalent, consistent with the notion that informed traders incorporate value-relevant information before it is publically released. The prevalence of insider trading is likely to be correlated with insider trading regulations. How the regulations affect the profitability of reported trades by corporate insiders remains an open question.

An alternative argument on a positive link between the strictness of insider trading regulations and profits to corporate insiders can be drawn based on the intuition suggested by Bhattacharya and Daouk (2002) that stricter regulations encourage more trading from outside investors increasing the liquidity of the market and hence allowing insiders to trade more profitably in more liquid markets. In fact, Christensen et al. (2016) document positive effects of the introduction of the MAD on stock market liquidity. In a similar context, Seyhun (1992) finds that the increase in the level and enforcement of insider trading regulations in the U.S. in the 1980s did not limit, but rather increased the volume and profitability of reported trading by corporate insiders.

We run a time series test to verify if the profitability of insider trading changes around the implementation of the Directive into local laws. To this end, the following model is estimated:

$$R_{pt,i} - R_{ft,i} = \alpha_i + \gamma_i MAD_{t,i} + \beta_i RMRF_{t,i} + \varepsilon_{pt,i}, \quad (4)$$

where $MAD_{t,i}$ is a dummy variable equal to one after the MAD was incorporated in local laws in country i, and it is equal to zero otherwise. MAD implementation dates are from Christensen et al. (2016). The coefficient of $MAD_{t,i}$, γ_i, measures the change in profitability, i.e. the change in α of insider portfolios after introduction of the MAD compared to the pre-MAD period. All other notation is as before. To provide a direct comparison, for each country the regressions are run using monthly observations for the unified period 2003-2012.

Results presented in Table 7 show a mix of positive and negative but largely insignificant coefficients of the MAD dummy which indicates no systematic shift in α's of insider portfolios around the implementation of the MAD. Only for Ireland the coefficients of the MAD dummy for purchase transaction are significant at the 10 percent level. They are positive indicating an increase in insider profits post-MAD but the increase comes after negative profits in the pre-MAD periods, as measured by the negative α.

The result of, generally, no systematic change in insider profits around the enactment of the MAD can be interpreted in different ways. First, one possible interpretation is that the MAD was ineffective and did not change the trading behavior of corporate insiders which would have shifted the trading profits insiders make. For example, the penalties for insider trading in new regulations are not severe enough to deter insider trading while, as documented by Bris (2005), the severity of penalties under insider trading laws can have an effect. Second, it is possible that pre-MAD country-level insider trading regulations in the five countries included in this test were of high quality and the marginal effect of the MAD introduction was therefore limited there. Beny (2005) develops an index of the quality of insider trading regulations measured in the 1990s and all five countries included in this test score three out of the maximum four points. Third, it is also possible that the *de jure* introduction of the market abuse laws did not bring any change to insider trading, as the law is likely to remain *de facto* ineffective without enforcement (Bhattacharya and Daouk, 2002). We address the latter two issues in cross-sectional tests presented in Section 6 below.

It is also possible that the enactment of the MAD had an effect on insider trading profits but the effect did not come as a shift in profits around the enactment date, which the regression analysis above is designed to pick up, but rather as a slow transition over time. A potential explanation for a progressive rather than abrupt effect of the MAD implementation on insiders' behavior could be anticipation of the enactment, but also the full implementation

and enforcement took some time. To shed light on the possibility that insider trading profits change slowly over time, we provide a graphical analysis of the evolution of α estimated in a rolling five-year window using full time series available for Germany, Ireland, Italy, the Netherlands and the U.K. Figure 1 plots estimated α's and their 95-percent confidence intervals for portfolios with the assumed 20-day holding period.[19] Altogether, α's vary slightly over time but there is no evidence of any statistically significant time effects in insider performance. In sum, the graphical analysis corroborates the regression results presented in Table 7 of no significant changes in insider trading profits in the sample period, driven by the MAD or other developments such as regulations beyond the MAD or changes in insider trading detection methods.

6. Cross-Country Determinants of Insider Profits

6.1. Theoretical Considerations

It is somewhat puzzling that insider portfolios in so few European countries yield significant realizable returns, in contrast to the evidence from the U.S. Why do not insiders in many European countries make profits from their reported transactions, at least over those hypothetical holding periods we investigate in our analysis? In this section we build on the heterogeneity of our sample countries across many dimensions to explore several regulatory, institutional and cultural factors that may affect profits to insider portfolios in a country to try to understand why insider trading profitability differs starkly across countries.

First, we look at a few regulatory differences specifically related to insider trading. We analyze the extent to which the MAD is implemented and enforced across the sample countries and we also look at some of the differences in reporting of insider trades and in

[19] To save space, figures for other holding periods are not presented but available from the authors upon request. Most of the significant results reported in the paper are found for the 20-day holding period therefore we choose that period for presentation.

implementation of closed periods during which corporate insiders are not allowed to trade, as introduced in Section 2.

Second, we look at a few economic factors which are driven by, or at least related to the legal origin of the country (see La Porta et al. (2008) for a review of the literature). In our sample the U.K. and Ireland belong to the group of common law countries, as does the U.S. On the other hand, the majority of European countries have a civil law legal tradition, divided into French, German and Scandinavian subtraditions, which are all represented in our sample. We investigate the link between insider profits and the following economic outcomes related to the legal origin: ownership structure, investor protection and executive compensation policies.

Furthermore, we look at cross-country differences in cultural and social dimensions such as innovativeness and religiosity. Lastly, we consider the role of trading costs. Below we discuss in detail all factors analyzed.

6.1.1. Strictness and Enforcement of Insider Trading Rules

As introduced in Section 2, insider trading regulatory frameworks across the E.E.A. member countries comply with the relevant E.U. directives, including the MAD. However, as reported by Christensen et al. (2016) individual countries differ in the strictness of implementation of MAD rules and their enforcement. We employ that cross-country variation to test the link between the MAD and the profitability of insider portfolios. The test complements the time series evidence in Section 5.4 above which due to data availability is limited to a few countries only and cannot fully exploit cross-sectional differences in regulations and enforcement.

As discussed in Section 5.4, the strictness of insider trading regulations can have opposite effects on profits to trading by corporate insiders. On the one hand, stricter rules can

discourage corporate insiders from trading on private information leading to a negative link between the strictness of regulations and insider profits. On the other hand, if stricter rules discourage trading on inside information across all investors, fewer insiders compete and hence corporate insiders who still trade can generate larger profits. Following this line of arguments, the link between the strictness of insider trading rules and insider α's is expected to be positive.

To measure the strictness of implementation of insider trading rules imposed by the MAD, we use the supervisory powers variable constructed by Christensen et al. (2016) based on a report by the Committee of European Securities Regulators (CESR). The variable measures the existence of powers available to local financial market authorities in a country associated with the translation of 86 specific MAD rules into local laws. Specifically, it equals the number of positive answers by the stock market authorities in the country to 86 questions in a questionnaire.[20] The higher the value of the variable, the larger the supervisory powers are regarding the transposition of the MAD into the country's market abuse laws. As reported in Table 8, the variable ranges from 59 in Norway to 80 in Latvia, with the sample mean of 67.

The law on the books can remain ineffective without enforcement (Bhattacharya and Daouk, 2002). Therefore we also test if the profits to insider trading in a country depend on an early enforcement action of MAD-based local laws. We source a relevant dummy variable from Christensen et al. (2016). The variable is equal to one if the authorities in the country took at least one enforcement action against violation of the MAD rules by 2009, and it is equal to zero otherwise. The variable is equal to one in 10 (59%) of the sample countries.

[20] For example, one of the questions is 'Does your authority have the power to establish whether or not an individual has access to insider information?' (see Christensen et al. (2016), footnote 27).

6.1.2. Closed Periods

Closed periods are meant to restrict trading when insiders have a significant information advantage against the general public. Therefore, theoretically, insider trading should be less profitable in countries where regulations specify closed periods compared to countries where insiders are free to trade at any time. Previous empirical evidence is mixed in this respect though. On the one hand, Betzer and Theissen (2009) document that in Germany where closed periods are not introduced, insiders' transactions prior to earnings announcements are more profitable compared to other trades. On the other hand, Hillier and Marshall (2002) analyze insider trading in the U.K. where insiders are not allowed to trade in the run-up to earnings announcements, and they conclude that even though closed periods affect the timing of insiders' trades, they do not alter their performance and insiders consistently earn abnormal returns irrespective of when they trade. To test the impact of closed periods on profits to insider trading in our paper we define, based on the information presented in Table 1, a dummy variable equal to one if there is either a closed period at the country level (i.e. in Estonia, France, Ireland, Sweden and the U.K.) or when firms are required (but not 'recommended' or 'advised') to adopt a closed period at the firm level (i.e. in Denmark and the Netherlands). The variable is equal to zero for all other countries.

6.1.3. Accelerated Trade Reporting

It is documented that insiders act strategically to their own benefit when they can report their trades with a delay. Betzer and Theissen (2010) find that lax reporting requirements in Germany before 2004 allowed insiders to delay reporting and that the delays were longer in firms with weaker outside oversight. They also find that stock prices were distorted in the period between the trade and the related announcement. Betzer et al. (2015) analyze insider trading and trade reporting in the U.S. before the Sarbanes-Oxley Act when insiders could report their trades until the 10^{th} day of the month after the month of trading.

They find that stealth trading, that is breaking large orders into smaller transactions to conceal private information (Barclay and Warner, 1993), as well late reporting were widespread, and also more common in firms with weak monitoring. Furthermore, outside investors perceived stealth trades as more likely to be based on private information. Altogether, both studies conclude that their respective results lend support for shorter trade reporting deadlines.

We test if insider trading profits are linked to reporting deadlines in our sample countries, as outlined in Section 2. We define a dummy variable equal to one if the disclosure of trades is accelerated and the reporting deadline is shorter than five working days mandated by the E.U. directives, even for a subset of trades (i.e., in Denmark, Greece, Iceland, Latvia, Netherlands, Norway, Spain, Switzerland and the U.K.). The dummy is equal to zero otherwise. Even though the standard deadline of five days seems already strict compared to, for example, the pre-Sarbanes-Oxley era in the U.S., the link between insider profits and reporting deadlines is worth testing. Jeng et al. (2003) document that as much as one quarter of six-month insider profits come in the first five days after the trade. Interestingly, the E.U. decided to review the five-day deadline and it was shortened to three days when the Market Abuse Regulation was introduced in 2016. Our results can hence shed light on whether accelerated reporting impacts on insider profits.

6.1.4. Ownership Concentration

As documented by LaPorta et al. (1998), there are significant differences in firms' ownership structures across countries. Firms in common law countries tend to be widely held with dispersed ownership, and firm ownership in civil law countries is concentrated, with dominant large blockholders. Those findings are confirmed by Faccio and Lang (2002) in a detailed study of ownership and control structures of listed companies across Europe.

Ownership structures determine corporate transparency and disclosure regimes. As documented by Ball et al. (2000), high-quality public disclosure is prevalent in common law countries where outside shareholding is dispersed as it is required to solve the information asymmetry problem to enable monitoring of managers to reduce agency conflicts. On the other hand, in civil law countries with concentrated ownership structures, the information asymmetry is resolved via closer manager-shareholder contacts, private channels of communication and closer relations with key stakeholders. Altogether, it can be argued that corporate transparency is higher in common law countries compared with civil law countries (Bushman et al., 2004).

We conjecture that private communication channels between managers, controlling shareholders and stakeholders in countries where ownership tends to be concentrated reduce the information advantage of corporate insiders. Private information can be incorporated in stock prices by actions of controlling owners, stakeholders or their associates, diminishing the scope for trading profits left to insiders. Earlier firm-level insider trading literature supports this view. Fidrmuc et al. (2006) provide evidence of lower abnormal returns following insider transactions in British firms controlled by other companies or by families and individuals unrelated to the directors, and, similarly, Betzer and Theissen (2009) show that post-trade abnormal returns to insiders in Germany are lower in closely-held firms compared to widely-held corporations.[21] The country-level evidence can complement these earlier studies and the within-country evidence presented in Section 5.3 above. Even though the analysis in Section 5.3 does not yield statistically significant within-country results, there may still be differences across countries, particularly if cross-country differences in ownership structures are greater than within-country differences. Given the arguments in LaPorta et al. (1998) on the

[21] Our argument is also supported by other related empirical evidence linking concentrated ownership structures and incorporation of private information into stock prices (e.g. Brockman and Yan, 2009; Anderson et al., 2012; Boubaker et al., 2014; Borisova and Yadav, 2015).

importance of country-level regulations for ownership concentration, one can assume that this is the case.

In sum, we expect a negative link between typical ownership concentration in a country and insider profits. We use the ownership concentration measure from LaPorta et al. (1998) as a country-level proxy for ownership structures. The measure is calculated as the mean combined ownership stake of 3 largest shareholders across 10 largest publically listed firms in the country. As reported in Table 8, the concentration is lowest in the U.K. (0.19) with much higher values in continental Europe, with the variable exceeding 0.50 in Greece, Italy, Belgium and Spain.

6.1.5. Investor Protection

Insider trading behavior can also be shaped by general standards of investor protection against expropriation by insiders. We proxy for investor protection using the anti-self-dealing index developed by Djankov et al. (2008). The index measures the protection of minority shareholders' rights in a hypothetical corporate transaction that enriches the management and controlling shareholders. The index takes the value between 0 and 1, and in our sample it ranges from 0.20 in the Netherlands to 0.95 in the U.K, with the sample mean of 0.41.

The link between investor protection and abnormal stock returns following insider transactions has been explored in the literature before and the results are mixed. Ravina and Sapienza (2010) analyze a U.S. sample and find that cumulative abnormal returns after insider trades are lower in firms with better governance standards. The result may indicate that insiders in better governed firms are more restricted in trading on the basis of material information at the expense of outside investors. On the other hand, Cziraki et al. (2014) find that in Dutch firms with better investor protection standards abnormal returns following insider transactions are higher. They argue that profits from legal insider trading substitute for

sacrificed benefits from investor expropriation through other channels. As opposed to firm-level tests within one country samples in Ravina and Sapienza (2010) and Cziraki et al. (2014), Fidrmuc et al. (2013) provide a cross-country analysis and find that abnormal stock price behavior following insider transactions is positively correlated with investor protection in a country. They interpret insider trades as information events and argue that insiders' actions are more trustworthy and informative in a better corporate governance environment which leads to higher abnormal returns following purchases. For sales, investor protection reduces the negative information content as investors trust liquidity and diversification motives for trades more. In light of the mixed prior results, we do not have strong theoretical priors regarding the link between insider trading profits and the quality of investor protection.

6.1.6. Compensation Policies

Fernandes et al. (2013) document that the ratio of equity-based pay (share and share option grants) to total pay differs across countries. Prevalent executive compensation policies in a country can in turn have an impact on insider trading incentives and, consequently, insider profits. The more equity insiders accumulate from compensation, the more likely they are to sell for liquidity and portfolio diversification reasons. Hence, we expect selling in such cases to be less driven by information and therefore to be less profitable. On the other hand, when insiders build up their equity holdings from remuneration grants, they are likely to purchase more equity on the open market only if they have a strong view about better prospects of the firm. Insider buying is in such a case more profitable. At the same time, less equity acquired through compensation may induce more buying to signal commitment and alignment of interests with outside shareholders which is less likely to be driven by specific favorable private information. Altogether, we expect a negative link between the profitability of insider selling and equity-linked compensation and a positive link for insider buying. As a proxy for the structure of compensation we use the mean ratio of equity based pay (stock and

option grants) to total compensation in a country, as reported by Fernandes et al. (2013).[22] In our sample, it takes the values from 0.009 in Spain to 0.287 in Switzerland.

6.1.7. Innovativeness

Bartram et al. (2012) find that stocks in more innovative countries are more volatile and they argue that specific institutional or social factors in a country encourage firms to innovate and invest in growth opportunities. As a consequence, innovativeness creates more firm-specific information and generates information asymmetries between insiders and outsiders. We argue that in more innovative environments there are potential insider trading opportunities, and at the same time insiders are rewarded for innovating within firms through greater trading profits. We proxy for the country-level innovativeness with the gross domestic spending on Research and Development (R&D) as a percentage of the Gross Domestic Product (GDP) available from the OECD Data website. For each country we average the annual measure over the 2008-2012 period. As reported in Table 8, the measure varies from 0.006 in Latvia to 0.033 in Sweden.

6.1.8. Religiosity

Grullon et al. (2010) and Callen and Fang (2015), among others, provide evidence on the impact of religiosity on corporate behavior. They build on the psychology literature to argue that religiosity influences behavior and ethics and hence that decisions of executives differ depending on the religious norms of the environment in which they live and work. It is because the executive is more likely to be religious in a more religious environment but also even if the executive is not religious herself, she is likely to act differently under the pressure of social norms of the environment trying to avoid the social stigma. As a result, executives in firms located in more religious environments are less likely to make decisions that are controversial or that can be considered negative.

[22] For some of the sample countries we source the data from an earlier draft of Fernandes et al. (2013) which presents tests for a broader sample of countries.

Given that profitable insider trading can be considered as benefitting insiders at the expense of uninformed outside investors, we argue that insiders in more religious countries are less likely to trade profitably. We measure religiosity in a country using Gallup's surveys in which respondents in 114 countries were asked a question on the importance of religion.[23] Our variable is based on the percentage of respondents who answered that religion is an important part of their daily life. It varies from 0.16 in Estonia to 0.72 in Italy, with the sample mean of 0.37 (see Table 8).

6.1.9. Trading Costs

Seyhun (1986) provides the first evidence on the link between corporate insiders' profits and trading costs. The argument builds on theoretical work by, among others, Glosten and Milgrom (1985) who present a model of adverse selection in financial markets in which the presence of informed traders leads market makers to increase spreads. Larger spreads allow market makers to offset losses they suffer in trades with well-informed insiders by gains from trading with uninformed traders. Despite the larger spreads, insiders are still able to make trading profits. However, on the one hand, profits to insider trading have to be larger in markets with wider spreads, as potential gains from trading on information with small value may not cover the higher trading costs. On the other hand, spreads in markets where insiders are active and trade profitably increase because of the adverse selection effects. Therefore, according to those arguments we expect to observe a positive relation between profits to insider trading and the average bid-ask spread in the country. We use effective spreads in our tests and we source them from Fong et al. (2017). The measure is based on percent effective spreads for all trades in a random sample of 30 stocks per country.

[23] http://www.gallup.com/poll/142727/religiosity-highest-world-poorest-nations.aspx

6.2. Empirical Evidence

We explore the link between the profitability of insider trading and the factors discussed above in a series of cross-sectional regressions with the point estimates of insider α's estimated over the 2008-2012 period (see Table 3) as the dependent variables. Similarly to Griffin et al. (2011), to prevent the degrees of freedom given our limited sample size we apply the following testing strategy. We start with a set of regressions with an intercept and a single independent variable of interest. Then, in the second step, we estimate regressions with a larger number of independent variables which are significant in the first step. All regressions are estimated using the Ordinary Least Squares (OLS) method with heteroskedasticity-consistent standards errors.

Results of the regressions including one independent variable of interest are reported in Panel A of Table 9. Looking first at purchase transactions, the anti-self-dealing index measuring the overall investor protection is statistically significant for three out of four horizons, with a positive coefficient indicating that insiders' realizable returns are larger in countries with stronger investor protection. The results are in line with the findings in Cziraki et al. (2014) and Fidrmuc et al. (2013) discussed above. Trading costs come significant at the 10 percent level or better also for three holding horizons, and consistently with the theoretical predictions we find a positive link between insider returns and trading costs in the country. The coefficients of ownership concentration are all negative in line with the expectations discussed above but they are significant only for the two longest holding periods. We also find some evidence, with one coefficient significant at the 10 percent level or better across the four horizons, that insider buying is more profitable when MAD supervisory powers are larger.[24] Buying is less profitable when insiders have to more timely report their trades, which

[24] As an alternative proxy for the prevalence of (undisclosed) insider trading, likely correlated with insider trading regulations, we use the average market reaction to public disclosures in a country from Griffin et al. (2011). Market reactions to public disclosure potentially capture a number of confounding factors but Griffin et

lends some support for the new E.U. regulations that shortened trade reporting deadline across the E.E.A. countries, and also in more religious environments. We do not find any statistically significant links between the profitability of insider buying and MAD enforcement, closed periods, equity compensation and innovativeness.

In one-variable regressions for sale transactions, generally fewer variables are significant. There is only some evidence on the link between the profitability of insider selling and the MAD, with selling being less profitable (i.e. α's being less negative) in countries in which MAD is more strictly implemented and enforced early. Overall the lack of statistically significant links between sales α's and the range of factors considered confirms our earlier conclusion that sale transactions are more likely to be undertaken for liquidity and diversification reasons and hence are not linked with the regulatory, economic and cultural factors we analyze. Consistent with the liquidity and diversification motives for insider selling, as discussed above, we find positive coefficients (indicating lower profitability) of the equity compensation variable across all horizons but they are all statistically insignificant.

In Panel B of Table 9 the regressions include all explanatory variables which are significant at the 10 percent level or better for the given transaction type and holding horizon in one-variable regressions reported in Panel A. When none or only one variable is significant in basic tests presented in Panel A, the relevant column in Panel B remains empty. The approach allows us to estimate if the variables identified as significant in one-variable regressions retain their significance when we control for other significant factors. The results and conclusions from the first step of the analysis presented above remain unchanged with two exceptions for purchase transactions. First, MAD supervisory powers lose their significance, and second, ownership concentration switches signs and once we control for

al. (2011) show that they are most strongly related to insider trading. The regressions yield (results are not tabulated) a statistically significant positive coefficient (coeff 1.8753, p-value 0.088) for buys and the 130-day holding period, indicating that disclosed trades by corporate insiders are more profitable when undisclosed insider trading is less rampant. It confirms that corporate insiders compete with other informed traders.

other factors, the link between insider buying profits and ownership concentration becomes positive, contrary to the theoretical expectations. This indicates that the basic results for ownership concentration we find in Panel A of Table 9 are not robust and possibly suffer from the omitted variable problem.

To summarize, the cross-sectional results reveal that, overall, the profitability of insider buying is higher in countries with better investor protection, which suggests a supplementary role of insider trading profits when expropriation of outsiders through other channels is limited, or a higher informational role of insiders' signals in better investor protection environments. Profitable buying is also positively linked with trading costs. The profitability of buying in the mid-term (130 trading days) is also lower in more religious countries, where insiders feel more constrained to act in a way that can be seen controversial, and insider profits are also lower when insiders have to report their transactions more promptly which limits the scope for strategic trading and trade reporting. Furthermore, the profitability of insider selling over the longer horizon (260 trading days) is lower in countries with more stringent and better enforced insider trading rules. Overall, in our limited sample size the results can be treated only as indicative and exploratory, but nevertheless we shed some light on structural differences between countries to show that various regulatory, economic and cultural factors have a potential to explain why the profits to insider trading differ so much across countries.

Because α, our dependent variable, is not directly observed but estimated in a regression, as a robustness check we run alternative Weighted Least Squares (WLS) estimations of the cross-sectional models, with weights equal to the inverse of the α's standard errors. Such an approach gives a higher weight to observations with more precisely estimated insider returns. The (untabulated) results and hence conclusions of the multivariate regressions analysis presented in Panel B of Table 9 remain very similar. The only difference

is that both MAD-related variables for sales over the 260-day horizon lose their significance.[25]

7. Conclusions

In this paper we ask a question of whether corporate insiders in 18 countries across Europe profit from trading in own firms' shares. Specifically, we test if portfolios that closely mimic reported insiders' purchase or sale transactions beat the respective stock market. Given the evidence of profitable corporate insider trading in the U.S. reported in the earlier literature, our results are somewhat surprising. We find that portfolios mimicking insider purchases generate statistically significant profits in few European countries, at least over the assumed hypothetical holding periods, and selling is largely unprofitable. Our conclusions are robust to the choice of the estimation method, sample period and sample composition.

Our further results demonstrate that there are no subsamples of firms with particular characteristics that would consistently offer significant returns. Therefore, we can conclude that the low profitability found in the broad sample also holds across subsamples. We then turn to the impact of the E.U. Market Abuse Directive on reported insider trading and find a mixed picture of significant changes in the number and/or volume of transactions, but no evidence of any systematic shift in the profitability of insider portfolios after the MAD was translated into local laws.

We also test whether insider profitability across countries is systematically linked with specific country-level regulatory, economic or cultural factors. We find some evidence that profits to insider portfolios are linked with the level of investor protection, trading costs, religiosity, trade reporting deadlines and the strictness and enforcement of insider trading rules in the country. Overall, our results indicate that given the inherent structural differences

[25] The results are untabulated to save space but are available from the authors upon request.

between countries across many dimensions, insider trading profits are likely to differ starkly across countries and insights on insider trading profitability in one country are not easily transferrable to other countries.

This study offers implications for policymakers and practitioners. First, our results show that regulators in Europe should not be concerned with the reported everyday trading by corporate insiders, as we find that they tend not to trade on economically valuable information. Second, the low profitability of insider trading we document indicates that reported share transactions by corporate insiders in Europe have limited usefulness for developing profitable trading strategies by outside investors. We show that at least a simple trading strategy mimicking all insider transactions is unlikely to systematically yield positive returns.

Further research could explore in detail the characteristics of insider portfolios in smaller countries where fewer insiders trade and hence the insider-mimicking portfolios contain fewer stocks and their composition can change considerably over time. To confirm robustness of our findings we offer a few different returns-based portfolio performance evaluation approaches, but further light on insider performance can be shed using an alternative portfolio holdings-based performance evaluation and attribution method (see Wermers (2006) for a review).

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Appendix A. Full baseline results for insider purchase portfolios

The table reports performance evaluation results for insider purchase portfolios applying the CAPM model presented in equation (1). The portfolios consist of all shares purchased by insiders in a given country in open market transactions and held for the specified period. The sample period is 2008-2012. Details of the sample are presented in Table 2. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

		α		RMRF				Months
	Holding period	coeff	(p-val)	coeff	(p-val)	R-sq	Number of observations	with empty portfolios
Belgium	20 days	0.0214*	(0.072)	1.0999***	(0.000)	0.451	59	0
	65 days	0.0156*	(0.058)	0.7977***	(0.000)	0.497	57	0
	130 days	0.0094*	(0.080)	0.7616***	(0.000)	0.665	54	0
	260 days	0.0027	(0.495)	0.8511***	(0.000)	0.688	48	0
Czech Rep	20 days	0.0015	(0.903)	0.9393***	(0.000)	0.293	59	9
	65 days	0.0169	(0.191)	0.9760***	(0.000)	0.298	57	0
	130 days	0.0153	(0.228)	0.8670***	(0.000)	0.270	54	0
	260 days	0.0100	(0.410)	1.2414***	(0.000)	0.412	48	0
Denmark	20 days	-0.0072	(0.595)	1.2241***	(0.000)	0.369	59	0
	65 days	-0.0020	(0.879)	1.1221***	(0.000)	0.365	57	0
	130 days	0.0005	(0.967)	0.7609***	(0.000)	0.254	54	0
	260 days	0.0013	(0.896)	0.6731***	(0.000)	0.246	48	0
Estonia	20 days	-0.0079	(0.493)	0.5776***	(0.000)	0.369	59	6
	65 days	0.0021	(0.887)	0.8498***	(0.000)	0.454	57	2
	130 days	0.0179	(0.297)	0.9561***	(0.000)	0.463	54	0
	260 days	0.0068	(0.573)	0.6982***	(0.000)	0.466	48	0
France	20 days	0.0094*	(0.083)	1.0115***	(0.000)	0.675	59	0
	65 days	-0.0006	(0.902)	1.0582***	(0.000)	0.718	57	0
	130 days	-0.0001	(0.983)	1.0306***	(0.000)	0.783	54	0
	260 days	0.0050	(0.235)	0.9996***	(0.000)	0.789	48	0
Germany	20 days	0.0273***	(0.004)	0.9195***	(0.000)	0.437	59	0
	65 days	0.0028	(0.726)	1.0172***	(0.000)	0.564	57	0
	130 days	0.0045	(0.473)	0.9138***	(0.000)	0.642	54	0
	260 days	0.0070*	(0.087)	0.7452***	(0.000)	0.749	48	0
Greece	20 days	0.0233*	(0.072)	0.5337***	(0.000)	0.312	59	0
	65 days	0.0039	(0.627)	0.5229***	(0.000)	0.544	57	0
	130 days	-0.0084	(0.242)	0.4002***	(0.000)	0.481	54	0
	260 days	-0.0099	(0.336)	0.4648***	(0.000)	0.398	48	0
Iceland	20 days	-0.0011	(0.881)	0.5870***	(0.000)	0.657	59	23
	65 days	-0.0077	(0.550)	0.6527***	(0.000)	0.424	57	9
	130 days	-0.0134	(0.407)	0.7852***	(0.000)	0.430	54	0
	260 days	0.0042	(0.272)	0.6086***	(0.000)	0.658	48	0
Ireland	20 days	0.0350*	(0.095)	0.6465**	(0.012)	0.105	59	2
	65 days	0.0150	(0.369)	0.8091***	(0.000)	0.233	57	0
	130 days	0.0145	(0.345)	0.7028***	(0.000)	0.217	54	0
	260 days	0.0171	(0.276)	0.6612***	(0.008)	0.141	48	0

(continued)

Appendix A. - *continued*

	Holding period	α		RMRF		R-sq	Number of observations	Months with empty portfolios
		Coeff	(p-val)	coeff	(p-val)			
Italy	20 days	0.0034	(0.562)	0.5406***	(0.000)	0.437	59	0
	65 days	-0.0103**	(0.032)	0.6394***	(0.000)	0.635	57	0
	130 days	-0.0070	(0.146)	0.7233***	(0.000)	0.693	54	0
	260 days	-0.0007	(0.989)	0.8101***	(0.000)	0.688	48	0
Latvia	20 days	0.0068	(0.613)	0.5662***	(0.003)	0.143	59	29
	65 days	0.0224	(0.169)	0.6225***	(0.007)	0.126	57	16
	130 days	0.0048	(0.742)	0.6404***	(0.002)	0.171	54	9
	260 days	0.0123	(0.388)	0.8485***	(0.000)	0.236	48	1
Lithuania	20 days	0.0013	(0.909)	0.9442***	(0.000)	0.563	59	5
	65 days	0.0095	(0.469)	0.7339***	(0.000)	0.368	57	1
	130 days	0.0069	(0.580)	0.9066***	(0.000)	0.521	54	0
	260 days	0.0022	(0.754)	0.8188***	(0.000)	0.699	48	0
Netherlands	20 days	0.0021	(0.872)	0.8516***	(0.000)	0.216	59	0
	65 days	-0.0093	(0.383)	0.8387***	(0.000)	0.302	57	0
	130 days	-0.0123	(0.272)	0.6356***	(0.001)	0.185	54	0
	260 days	-0.0016	(0.897)	0.7737***	(0.002)	0.194	48	0
Norway	20 days	0.0264**	(0.029)	0.6412***	(0.000)	0.231	59	0
	65 days	0.0099	(0.267)	0.5913***	(0.000)	0.324	57	0
	130 days	0.0055	(0.449)	0.5180***	(0.000)	0.357	54	0
	260 days	0.0089*	(0.053)	0.5871***	(0.000)	0.550	48	0
Spain	20 days	0.0015	(0.863)	0.8034***	(0.000)	0.444	59	0
	65 days	0.0000	(0.998)	0.7511***	(0.000)	0.507	57	0
	130 days	-0.0063	(0.353)	0.8265***	(0.000)	0.613	54	0
	260 days	-0.0071	(0.341)	0.9214***	(0.000)	0.644	48	0
Sweden	20 days	0.0018	(0.790)	0.6236***	(0.000)	0.360	59	0
	65 days	0.0049	(0.350)	0.6528***	(0.000)	0.531	57	0
	130 days	0.0029	(0.534)	0.8064***	(0.000)	0.681	54	0
	260 days	0.0055	(0.109)	0.8349***	(0.000)	0.807	48	0
Switzerland	20 days	-0.0013	(0.866)	0.8168***	(0.000)	0.246	59	0
	65 days	-0.0095	(0.176)	1.0457***	(0.000)	0.426	57	0
	130 days	-0.0055	(0.512)	1.2408***	(0.000)	0.424	54	0
	260 days	0.0065	(0.390)	1.2715***	(0.000)	0.487	48	0
U.K.	20 days	0.0371***	(0.004)	0.9516***	(0.001)	0.192	59	0
	65 days	0.0168	(0.116)	1.2905***	(0.000)	0.401	57	0
	130 days	0.0085	(0.311)	1.4540***	(0.000)	0.582	54	0
	260 days	0.0039	(0.543)	1.4016***	(0.000)	0.669	48	0

Appendix B. Full baseline results for insider sale portfolios

The table reports performance evaluation results for insider sale portfolios applying the CAPM model presented in equation (1). The portfolios consist of all shares sold by insiders in a given country in open market transactions and held for the specified period. The sample period is 2008-2012. Details of the sample are presented in Table 2. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

		α		RMRF				Months
	Holding period	coeff	(p-val)	coeff	(p-val)	R-sq	Number of observations	with empty portfolios
Belgium	20 days	0.0148*	(0.070)	0.3629***	(0.002)	0.161	59	0
	65 days	0.0144***	(0.006)	0.4306***	(0.000)	0.427	57	0
	130 days	0.0156***	(0.000)	0.5369***	(0.000)	0.693	54	0
	260 days	0.0084**	(0.018)	0.6425***	(0.000)	0.620	48	0
Czech Rep	20 days	-0.0093	(0.223)	0.4913***	(0.000)	0.225	59	19
	65 days	-0.0076	(0.327)	0.5963***	(0.000)	0.307	57	7
	130 days	-0.0100	(0.215)	0.7501***	(0.000)	0.405	54	2
	260 days	-0.0034	(0.559)	0.4328***	(0.000)	0.271	48	0
Denmark	20 days	-0.0153	(0.139)	0.7918***	(0.000)	0.298	59	0
	65 days	-0.0083	(0.391)	0.7324***	(0.000)	0.301	57	0
	130 days	-0.0140*	(0.097)	0.8375***	(0.000)	0.450	54	0
	260 days	-0.0144**	(0.037)	0.6440***	(0.000)	0.385	48	0
Estonia	20 days	-0.0073	(0.664)	0.3838**	(0.011)	0.108	59	16
	65 days	-0.0046	(0.807)	0.7705***	(0.000)	0.290	57	7
	130 days	0.0307	(0.180)	1.2147***	(0.000)	0.440	54	4
	260 days	0.0102	(0.573)	1.0235***	(0.000)	0.459	48	0
France	20 days	0.0009	(0.837)	0.8886***	(0.000)	0.707	59	0
	65 days	0.0026	(0.561)	0.8720***	(0.000)	0.708	57	0
	130 days	-0.0029	(0.481)	0.9047***	(0.000)	0.760	54	0
	260 days	0.0020	(0.492)	0.8234***	(0.000)	0.843	48	0
Germany	20 days	-0.0044	(0.716)	0.4641**	(0.015)	0.100	59	0
	65 days	0.0058	(0.472)	0.5953***	(0.000)	0.300	57	0
	130 days	0.0004	(0.949)	0.7185***	(0.000)	0.472	54	0
	260 days	0.0051	(0.233)	0.4764***	(0.000)	0.519	48	0
Greece	20 days	-0.0018	(0.902)	0.7254***	(0.000)	0.393	59	0
	65 days	0.0012	(0.935)	0.6744***	(0.000)	0.371	57	0
	130 days	-0.0125	(0.196)	0.5268***	(0.000)	0.469	54	0
	260 days	-0.0050	(0.539)	0.5764***	(0.000)	0.617	48	0
Iceland	20 days	-0.0089	(0.321)	0.8660***	(0.000)	0.721	59	31
	65 days	0.0001	(0.989)	0.9075***	(0.000)	0.833	57	14
	130 days	-0.0020	(0.786)	0.5447***	(0.000)	0.639	54	3
	260 days	0.0110**	(0.044)	0.4927***	(0.000)	0.393	48	0
Ireland	20 days	0.0145	(0.105)	0.6099***	(0.000)	0.362	59	5
	65 days	0.0064	(0.513)	0.5888***	(0.000)	0.317	57	0
	130 days	0.0111	(0.169)	0.5683***	(0.000)	0.400	54	0
	260 days	0.0025	(0.704)	0.5777***	(0.000)	0.411	48	0

(continued)

Appendix B. - *continued*

	Holding period	α		RMRF		R-sq	Number of observations	Months with empty portfolios
		coeff	(p-val)	coeff	(p-val)			
Italy	20 days	-0.0109	(0.302)	0.6253***	(0.000)	0.241	59	0
	65 days	-0.0059	(0.374)	0.5736***	(0.000)	0.417	57	0
	130 days	0.0007	(0.912)	0.5859***	(0.000)	0.470	54	0
	260 days	0.0062	(0.127)	0.4200***	(0.000)	0.537	48	0
Latvia	20 days	-0.0053	(0.492)	0.4024***	(0.000)	0.204	59	47
	65 days	-0.0095	(0.447)	0.9269***	(0.000)	0.351	57	33
	130 days	0.0022	(0.897)	1.5658***	(0.000)	0.487	54	21
	260 days	0.0218	(0.316)	1.5383***	(0.000)	0.306	48	7
Lithuania	20 days	-0.0094	(0.387)	0.3331***	(0.003)	0.143	59	21
	65 days	-0.0176	(0.174)	0.8286***	(0.000)	0.433	57	6
	130 days	-0.0198	(0.126)	0.7956***	(0.000)	0.441	54	1
	260 days	0.0069	(0.555)	0.6739***	(0.000)	0.367	48	0
Netherlands	20 days	0.0106	(0.228)	0.5215***	(0.001)	0.188	59	0
	65 days	0.0044	(0.489)	0.6998***	(0.000)	0.459	57	0
	130 days	0.0087	(0.119)	0.5364***	(0.000)	0.392	54	0
	260 days	0.0023	(0.628)	0.5419***	(0.000)	0.433	48	0
Norway	20 days	-0.0233*	(0.070)	0.6078***	(0.001)	0.191	59	0
	65 days	-0.0174**	(0.020)	0.7099***	(0.000)	0.506	57	0
	130 days	-0.0032	(0.552)	0.6432***	(0.000)	0.616	54	0
	260 days	0.0041	(0.460)	0.4885***	(0.000)	0.358	48	0
Spain	20 days	-0.0031	(0.705)	0.8607***	(0.000)	0.506	59	0
	65 days	-0.0027	(0.667)	0.7725***	(0.000)	0.601	57	0
	130 days	-0.0080	(0.135)	0.7841***	(0.000)	0.696	54	0
	260 days	-0.0075	(0.161)	0.8315***	(0.000)	0.741	48	0
Sweden	20 days	-0.0099	(0.166)	0.9777***	(0.000)	0.566	59	0
	65 days	-0.0091	(0.198)	0.7314***	(0.000)	0.446	57	0
	130 days	-0.0054	(0.273)	0.5982***	(0.000)	0.522	54	0
	260 days	0.0028	(0.509)	0.5639***	(0.000)	0.543	48	0
Switzerland	20 days	0.0077	(0.522)	1.2652***	(0.000)	0.259	59	0
	65 days	0.0039	(0.419)	1.0390***	(0.000)	0.610	57	0
	130 days	0.0060	(0.113)	0.9899***	(0.000)	0.702	54	0
	260 days	0.0050	(0.193)	0.8899***	(0.000)	0.6470	48	0
U.K.	20 days	0.0016	(0.781)	0.9106***	(0.000)	0.523	59	0
	65 days	-0.0006	(0.886)	0.9247***	(0.000)	0.649	57	0
	130 days	0.0001	(0.976)	0.9768***	(0.000)	0.661	54	0
	260 days	0.0094**	(0.012)	0.7964***	(0.000)	0.678	48	0

Table 1. Regulations of transactions by corporate insiders

The table summarizes key regulations of trading and reporting of trading by corporate insiders. The regulations were in place at the end of the sample period (December 2012) and were driven by the E.U. Market Abuse Directive (MAD). The MAD was replaced in 2016 by the new E.U. Market Abuse Regulation (MAR) which changed the reporting deadlines and introduced closed periods throughout the E.U. countries.

Country	Reporting deadline	Exclusions	Closed periods
Belgium	5 working days	Trades with aggregate value of less than EUR 5,000 in a calendar year	None
Czech Rep	5 working days	None	None
Denmark	2 working days	Trades with aggregate value of less than EUR 5,000 in a calendar year	Each issuer's internal rules shall contain a period within which directors are permitted to trade. The maximum length of this period is six weeks after each published interim report or preliminary announcement of annual results.
Estonia	5 working days	None	From 1 week before the end of the reporting period and ending 1 day after the disclosure of the financial results.
France	5 working days	Trades with aggregate value of less than EUR 5,000 in a calendar year	Directors are not allowed to trade within a period of 15 days preceding the publication of annual, half yearly or quarterly reports.
Germany	5 working days	Trades with aggregate value of less than EUR 5,000 in a calendar year	None
Greece	4 working days	Trades with aggregate value of less than EUR 5,000 in a calendar year	None
Iceland	1 working day. Trades by management should be made public immediately.	None	None. Designation of closed periods is recommended by the regulator.
Ireland	5 working days	Trades with aggregate value of less than EUR 5,000 in a calendar year	60 days immediately preceding the preliminary announcement of the full year results and the publication of the half yearly results. 30 days immediately preceding publication of quarterly results.
Italy	5 working days	Trades with aggregate value of less than EUR 5,000 in a calendar year	None but many listed companies have adopted on a discretionary basis specific rules on internal dealing specifying blackout periods.
Latvia	4 working days	Trades with aggregate value of less than EUR 5,000 in a calendar year	None
Lithuania	5 working days	None	None

(continued)

Table 1. - *continued*

Country	Reporting deadline	Exclusions	Closed periods
Netherlands	5 working days. The CEO and MD must make immediate disclosures.	Trades with aggregate value of less than EUR 5,000 in a calendar year	Each issuer must define its own close periods but there is no set length of time which they must adhere to.
Norway	1 working day	None	None
Spain	4 working days	None	None
Sweden	5 working days	Companies listed on First North Exchange	For 30 days before an earnings report is announced.
Switzerland	2 working days	Transactions that total less than CHF 100,000 in a calendar month are not made public by SIX Swiss Exchange	None, however insiders are advised to abstain from trading for 20 days prior to earnings announcements
U.K.	4 working days	None	The shorter of the end of the year to disclosure date or 60 days before disclosure of the annual report and preliminary announcement of annual results. From the end of the reporting period to the date the semi-annual report is disclosed. The shorter of the end of the year to disclosure date or 30 days before disclosure of the quarterly report.

Table 2. Data coverage

The data set includes open market share purchase and sale transactions reported by corporate insiders. The data are obtained from Directors Deals Ltd.

Country	From	To	Number of months	Total number of purchases	Total number of sales	Avg number of purchases per month	Avg number of sales per month	Total volume of purchases (million)	Total volume of sales (million)	Avg volume of purchases per month (million)	Avg volume of sales per month (million)
Belgium	May-06	Dec-12	80	1,588	1,608	19.9	20.1	46.53	119.59	0.58	1.49
Czech Rep	Jan-05	Dec-12	96	238	223	2.5	2.3	3.63	11.32	0.04	0.12
Denmark	Jan-07	Dec-12	72	2,090	856	29.0	11.9	173.42	176.52	2.41	2.45
Estonia	Jan-05	Dec-12	96	256	181	2.7	1.9	37.16	115.71	0.39	1.21
France	Apr-06	Dec-12	81	9,943	8,164	122.8	100.8	597.25	818.70	7.37	10.11
Germany	Jul-02	Dec-12	126	10,158	6,514	80.6	51.7	403.36	832.61	3.20	6.61
Greece	Jan-08	Dec-12	60	12,815	1,833	213.6	30.6	1,154.56	560.08	19.24	9.33
Iceland	Jan-07	Dec-12	72	201	141	2.8	2.0	8,196.74	20,336.50	113.84	282.45
Ireland	Jan-99	Dec-12	168	603	456	3.6	2.7	274.86	139.34	1.64	0.83
Italy	Jan-03	Dec-12	120	10,450	6,715	87.1	56.0	1,849.22	3,668.54	15.41	30.57
Latvia	Jun-07	Dec-12	67	67	32	1.0	0.5	14.33	2.09	0.21	0.03
Lithuania	Jan-07	Dec-12	72	320	81	4.4	1.1	24.39	11.08	0.34	0.15
Netherlands	Apr-99	Dec-12	165	1,944	3,383	11.8	20.5	609.21	167.92	3.69	1.02
Norway	Jan-07	Dec-12	72	4,247	1,695	59.0	23.5	777.90	967.01	10.80	13.43
Spain	Sep-06	Dec-12	76	3,362	1,138	44.2	15.0	535.17	545.84	7.04	7.18
Sweden	Jan-07	Dec-12	72	8,433	4,112	117.1	57.1	1,096.77	1,597.85	15.23	22.19
Switzerland	Feb-07	Dec-12	71	4,438	5,323	62.5	75.0	99.73	233.66	1.40	3.29
U.K.	Jan-99	Dec-12	168	28,177	25,019	167.7	148.9	3,131.83	7,077.10	18.64	42.13

Table 3. α's of insider portfolios in 18 European countries, common sample period (2008-2012)

The table summarises the results of the performance evaluation analysis for insider purchase and sale portfolios. The performance is measured as α from the CAPM model presented in equation (1). The portfolios consist of all shares purchased or sold by insiders in a given country in open market transactions and held for the specified period. Details of the sample are presented in Table 2.

Holding period	Zero (insignificant)	Positive (p-value < 0.05)	Negative (p-value < 0.05)	Mean	Median
Panel A. Purchases					
20 days	15	3	0	0.0101	0.0027
65 days	17	0	1	0.0045	0.0033
130 days	18	0	0	0.0021	0.0037
260 days	18	0	0	0.0041	0.0046
Panel B. Sales					
20 days	18	0	0	-0.0033	-0.0048
65 days	16	1	1	-0.0025	-0.0017
130 days	17	1	0	-0.0001	-0.0009
260 days	14	3	1	0.0037	0.0045

Table 4. α's of insider portfolios, alternative estimation methods

The table summarises the results of the performance evaluation analysis for insider purchase (Panel A) and sale (Panel B) portfolios for alternative estimation methods. The performance is measured as α from the CAPM model presented in equation (1), unless stated otherwise. The portfolios consist of all shares purchased or sold by insiders in a given country in open market transactions and held for the specified period. Panels A1 and B1 report results on α's from a version of model (1) where the slope coefficient is set to one. Panels A2 and B2 contain results from model (2), i.e., a version of model (1) where the lagged excess market return is added as an explanatory variable. Panels A3 and B3 summarize results on model (1) α's obtained from a reduced sample, containing only those 12 countries with the largest number of listed firms. Results in Panels A4 and B4 are for the four-factor model presented in equation (3). Results in Panels A5 and B5 are from model (1) estimated for the post-crisis 2009-2012 period while the results in Panels A6 and B6 are for the full available sample period for each country, with the sample period varying across countries. Unless stated otherwise, the sample period is 2008-2012. Details of the sample are presented in Table 2.

(continued)

Table 4. - *continued*

Holding period	Zero (insignificant)	Positive (p-value < 0.05)	Negative (p-value < 0.05)	Mean	Median
Panel A. Purchases					
A1. CAPM with β set to one					
20 days	14	4	0	0.0118	0.0080
65 days	18	0	0	0.0061	0.0029
130 days	18	0	0	0.0037	0.0053
260 days	18	0	0	0.0032	0.0036
A2. CAPM regression with lagged excess market return					
20 days	14	4	0	0.0109	0.0035
65 days	17	0	1	0.0059	0.0051
130 days	18	0	0	0.0035	0.0036
260 days	18	0	0	0.0030	0.0044
A3. 12 countries with the largest number of listed firms					
20 days	9	3	0	0.0121	0.0064
65 days	11	0	1	0.0018	0.0014
130 days	12	0	0	-0.0007	0.0002
260 days	12	0	0	0.0018	0.0033
A4. Four-factor model					
20 days	9	4	0	0.0154	0.0097
65 days	10	2	1	0.0046	0.0019
130 days	12	1	0	0.0021	0.0029
260 days	11	2	0	0.0038	0.0044
A5. Post-crisis 2009-2012 period					
20 days	13	5	0	0.0136	0.0066
65 days	17	1	0	0.0089	0.0083
130 days	17	1	0	0.0052	0.0059
260 days	17	1	0	0.0023	0.0030
A6. Maximum window available for each country					
20 days	13	5	0	0.0103	0.0067
65 days	16	2	0	0.0056	0.0048
130 days	16	2	0	0.0037	0.0035
260 days	17	1	0	0.0004	0.0005

(continued)

Table 4. - *continued*

Holding period	Zero (insignificant)	Positive (p-value < 0.05)	Negative (p-value < 0.05)	Mean	Median
Panel B. Sales					
B1. CAPM with β set to one					
20 days	17	1	0	-0.0022	-0.0039
65 days	16	1	1	-0.0016	-0.0016
130 days	17	1	0	0.0013	-0.0002
260 days	16	1	1	0.0021	0.0016
B2. CAPM regression with lagged excess market return					
20 days	18	0	0	-0.0028	-0.0043
65 days	16	1	1	-0.0023	-0.0021
130 days	17	1	0	-0.0000	-0.0015
260 days	15	2	1	0.0029	0.0029
B3. 12 countries with the largest number of listed firms					
20 days	12	0	0	-0.0028	-0.0024
65 days	10	1	1	-0.0010	0.0003
130 days	11	1	0	-0.0012	-0.0014
260 days	9	2	1	0.0015	0.0035
B4. Four-factor model					
20 days	12	1	0	0.0000	-0.0013
65 days	11	1	1	0.0004	-0.0014
130 days	12	1	0	0.0000	-0.0009
260 days	10	3	0	0.0017	0.0045
B5. Post-crisis 2009-2012 period					
20 days	18	0	0	0.0011	-0.0013
65 days	17	1	0	0.0012	0.0015
130 days	17	1	0	0.0006	0.0022
260 days	18	0	0	0.0009	0.0026
B6. Maximum window available for each country					
20 days	16	2	0	-0.0013	-0.0019
65 days	16	2	0	-0.0012	-0.0012
130 days	14	3	1	-0.0011	-0.0011
260 days	15	1	2	-0.0004	0.0007

Table 5. α's of insider portfolios across firm categories

The table summarises the results of the performance evaluation analysis for insider purchase (Panel A) and sale (Panel B) portfolios for alternative firm categories over the 2008-2012 period. The performance is measured as α from the CAPM model presented in equation (1). The portfolios consist of all shares purchased or sold by insiders in a given country in open market transactions and held for the specified period. Panels A1 and B1 report results for firms with different market capitalization, Panels A2 and B2 display results for firms with and without analyst coverage, Panels A3 and B3 show results for high tech versus non high tech firms, and Panels A4 and B4 summarize results for firms with high versus low levels of closely held shares. Differences between categories are measured using paired tests and the p-values of the tests are reported in parentheses. ** and * denote statistical significance at the 5% and 10% levels, respectively. The sample includes 12 largest countries selected from the full sample presented in Table 2.

	Holding period	Zero (insignificant)	Positive (p-value < 0.05)	Negative (p-value < 0.05)	Mean	Median
Panel A. Purchases						
A1. Market capitalization						
Large	20 days	8	4	0	0.0088	0.0080
	260 days	12	0	0	0.0028	0.0044
Small	20 days	8	4	0	0.0151	0.0138
	260 days	12	0	0	0.0012	0.0007
Diff (p-value)	*20 days*				*(0.307)*	*(0.470)*
	260 days				*(0.567)*	*(0.519)*
A2. Analyst coverage						
> 0	20 days	9	3	0	0.0113	0.0084
	260 days	12	0	0	0.0029	0.0042
0	20 days	9	2	1	0.0110	0.0120
	260 days	11	0	1	0.0008	0.0061
Diff (p-value)	*20 days*				*(0.965)*	*(0.850)*
	260 days				*(0.609)*	*(0.733)*
A3. Industry						
High tech	20 days	12	0	0	0.0028	0.0018
	260 days	10	2	0	0.0098	0.0128
Other	20 days	10	2	0	0.0137	0.0161
	260 days	11	1	0	-0.0000	0.0004
Diff (p-value)	*20 days*				*(0.025)***	*(0.034)***
	260 days				*(0.130)*	*(0.233)*
A4. Closely held shares						
High	20 days	9	3	0	0.0122	0.0081
	260 days	10	2	0	0.0012	0.0033
Low	20 days	10	2	0	0.0136	0.0087
	260 days	12	0	0	0.0028	0.0027
Diff (p-value)	*20 days*				*(0.688)*	*(0.677)*
	260 days				*(0.533)*	*(0.733)*

(continued)

Table 5. - *continued*

	Holding period	Zero (insignificant)	Positive (p-value < 0.05)	Negative (p-value < 0.05)	Mean	Median
Panel A. Sales						
B1. Market capitalization						
Large	20 days	12	0	0	-0.0022	0.0004
	260 days	9	3	0	0.0034	0.0048
Small	20 days	10	0	2	-0.0067	-0.0076
	260 days	8	1	3	-0.0050	-0.0042
Diff (p-value)	*20 days*				*(0.436)*	*(0.470)*
	260 days				*(0.058)* *	*(0.043)* **
B2. Analyst coverage						
> 0	20 days	10	0	2	-0.0011	-0.0003
	260 days	9	3	0	0.0032	0.0040
0	20 days	11	0	1	-0.0010	-0.0003
	260 days	10	1	1	0.0006	0.0039
Diff (p-value)	*20 days*				*(0.985)*	*(0.970)*
	260 days				*(0.605)*	*(0.733)*
B3. Industry						
High tech	20 days	10	1	1	-0.0018	-0.0006
	260 days	10	2	0	0.0091	0.0077
Other	20 days	11	0	1	0.0020	0.0005
	260 days	10	2	0	0.0022	0.0006
Diff (p-value)	*20 days*				*(0.273)*	*(0.092)* *
	260 days				*(0.140)*	*(0.204)*
B4. Closely held shares						
High	20 days	11	0	1	-0.0033	0.0001
	260 days	9	2	1	0.0028	0.0058
Low	20 days	12	0	0	-0.0027	-0.0005
	260 days	11	1	0	0.0014	0.0026
Diff (p-value)	*20 days*				*(0.884)*	*(0.850)*
	260 days				*(0.592)*	*(0.677)*

Table 6. Insider trading before and after MAD implementation

This table provides information on insider trading activity before and after the E.U. Market Abuse Directive (MAD) was implemented in the national law in a given country. The Pre-MAD period starts in January 2003 and runs until the last month before the MAD was implemented. The Post-MAD period starts in the MAD implementation month and runs until December 2012. p-values of the test for differences in means are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. The data on insider trades are obtained from Directors Deals Ltd, and the data on MAD implementation dates (in parentheses) are from Christensen et al. (2016).

Country (MAD implementation date)	Period	Avg number of purchases per month	Avg number of sales per month	Avg volume of purchases per month (million)	Avg volume of sales per month (million)
Germany (Oct-04)	Pre-MAD	39.6	51.0	2.25	4.41
	Post-MAD	88.9	52.9	3.34	7.09
	Diff (p-value)	*(0.000)****	*(0.787)*	*(0.232)*	*(0.021)***
Ireland (Jul-05)	Pre-MAD	2.5	1.7	0.24	1.96
	Post-MAD	5.1	4.5	3.33	0.99
	Diff (p-value)	*(0.001)****	*(0.000)****	*(0.133)*	*(0.099)**
Italy (May-05)	Pre-MAD	32.3	51.8	7.86	8.72
	Post-MAD	103.8	57.2	17.71	37.22
	Diff (p-value)	*(0.000)****	*(0.471)*	*(0.006)****	*(0.002)****
Netherlands (Oct-05)	Pre-MAD	7.5	20.0	4.27	0.44
	Post-MAD	13.6	19.9	5.03	1.60
	Diff (p-value)	*(0.000)****	*(0.977)*	*(0.848)*	*(0.021)***
U.K. (Jul-05)	Pre-MAD	150.1	116.0	12.11	54.87
	Post-MAD	156.7	195.9	22.85	49.37
	Diff (p-value)	*(0.645)*	*(0.000)****	*(0.001)****	*(0.773)*

Table 7. The impact of MAD implementation on insider trading α's – time series evidence

This table presents the results of the performance evaluation analysis for insider purchase (Panel A) and sale (Panel B) portfolios over the 2003-2012 period. The performance is measured as α from the model presented in equation (4). 'MAD' refers to the coefficient on the MAD dummy in model (4), with the variable being equal to zero before and to one after the MAD was implemented into the national law in a given country. 'RMRF' refers to the coefficient on excess market return in model (4). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Holding period	α		MAD		RMRF		
		coeff	(p-val)	coeff	(p-val)	coeff	(p-val)	R-sq
Panel A. Purchases								
Germany	20 days	0.0232	(0.153)	-0.0026	(0.882)	0.9226***	(0.000)	0.367
	260 days	0.0116	(0.399)	-0.0085	(0.552)	0.9297***	(0.000)	0.612
Ireland	20 days	-0.0198	(0.407)	0.0477*	(0.086)	0.6540***	(0.000)	0.110
	260 days	-0.0355*	(0.099)	0.0453*	(0.057)	0.8391***	(0.000)	0.288
Italy	20 days	0.0055	(0.516)	0.0013	(0.893)	0.6484***	(0.000)	0.422
	260 days	0.0011	(0.901)	0.0002	(0.983)	0.8151***	(0.000)	0.661
Netherlands	20 days	0.0435**	(0.014)	-0.0334	(0.104)	0.7984***	(0.000)	0.177
	260 days	-0.0030	(0.842)	0.0033	(0.841)	0.7143***	(0.000)	0.231
U.K.	20 days	0.0313**	(0.022)	-0.0010	(0.950)	0.9464***	(0.000)	0.215
	260 days	0.0062	(0.512)	-0.0030	(0.774)	1.2278***	(0.000)	0.609
Panel B. Sales								
Germany	20 days	0.0077	(0.661)	-0.0094	(0.621)	0.5480***	(0.000)	0.152
	260 days	0.0059	(0.561)	-0.0045	(0.673)	0.6351***	(0.000)	0.572
Ireland	20 days	-0.0011	(0.925)	0.0147	(0.290)	0.6128***	(0.000)	0.282
	260 days	-0.0152	(0.283)	0.0178	(0.253)	0.6003***	(0.000)	0.317
Italy	20 days	0.0023	(0.858)	-0.0087	(0.543)	0.7007***	(0.000)	0.282
	260 days	0.0075	(0.358)	-0.0099	(0.261)	0.5365***	(0.000)	0.489
Netherlands	20 days	0.0063	(0.598)	0.0046	(0.743)	0.6889***	(0.000)	0.226
	260 days	0.0131*	(0.087)	-0.0083	(0.323)	0.4338***	(0.000)	0.307
U.K.	20 days	-0.0044	(0.540)	0.0049	(0.553)	0.9706***	(0.000)	0.502
	260 days	-0.0009	(0.909)	0.0036	(0.677)	0.9216***	(0.000)	0.559

Table 8. Explanatory variables for cross-sectional tests

The table presents explanatory variables used in regressions to explain cross-country differences in the performance of insider portfolios. *MAD Supervisory Powers* measures the existence of powers available to local authorities associated with the translation of 86 specific Market Abuse Directive rules into local laws (source: Christensen et al., 2016). *MAD Action Taken* is a dummy equal to one if the authorities in a given country took at least one enforcement action against violation of MAD rules by 2009. It is equal to zero otherwise (source: Christensen et al., 2016). *Closed Periods* is a dummy variable equal to one if there are either closed periods in which insiders are not allowed to trade introduced at the country level or when firms are required to adopt closed periods at the firm level. The variable is equal to zero otherwise. *Accelerated Trade Reporting* is a dummy variable equal to one if the trade reporting deadline is shorter than five working days mandated by the E.U. directives, even for a subset of trades. The dummy is equal to zero otherwise. Both *Closed Periods* and *Accelerated Trade Reporting* are defined based on the information in Table 1. *Ownership Concentration* is the mean combined ownership stake of 3 largest shareholders across 10 largest publically listed firms in the country (source: LaPorta et al., 1998). *Anti-Self-Dealing Index* measures the protection of minority shareholders in the country against expropriation by management and controlling shareholders (source: Djankov et al., 2008). *Equity Compensation* is the mean ratio of equity-linked pay to total CEO pay in the country (source: Fernandes at al., 2013). *Innovativeness* is the gross domestic spending on Research and Development (R&D) as a percentage of the Gross Domestic Product (GDP) (source: OECD). *Religiosity* is the percentage of survey respondents in the country who answered that religion is an important part of their daily life (source: Gallup). *Trading Costs* is the average percent effective spreads for all trades in a random sample of 30 stocks per country (source: Fong et al., 2017).

(continued)

Table 8. - *continued*

Country	MAD Supervisory Powers	MAD Action Taken	Closed Periods	Accelerated Trade Reporting	Ownership Concentration	Anti-Self-Dealing Index	Equity Compensation	Innovativeness	Religiosity	Trading Costs
Belgium	69	0	0	0	0.54	0.54	0.088	0.021	0.33	0.012
Czech Rep	64	0	0	0		0.33		0.014	0.21	
Denmark	60	0	1	1	0.45	0.46	0.192	0.029	0.19	0.015
Estonia	60	1	1	0				0.017	0.16	
France	75	1	1	0	0.34	0.38	0.155	0.022	0.30	0.016
Germany	64	1	0	0	0.48	0.28	0.098	0.027	0.40	0.020
Greece	60	0	0	1	0.67	0.22		0.007	0.71	0.019
Iceland	60	1	0	1		0.26		0.026		
Ireland	73	0	1	0	0.39	0.79	0.202	0.015	0.54	0.017
Italy	70	1	0	0	0.58	0.42	0.115	0.012	0.72	0.007
Latvia	80	1	0	1		0.32		0.006	0.39	
Lithuania	70	0	0	0		0.36			0.42	
Netherlands	67	1	1	1	0.39	0.20	0.203	0.018	0.33	0.013
Norway	59	1	0	1	0.36	0.42	0.168	0.016	0.21	0.019
Spain	60	0	0	1	0.51	0.37	0.009	0.013	0.49	0.007
Sweden	73	1	1	0	0.28	0.33	0.015	0.033	0.17	0.016
Switzerland			0	1	0.41	0.27	0.287	0.029	0.41	0.015
U.K.	76	1	1	1	0.19	0.95	0.249	0.017	0.27	0.016
Mean	67.06	0.59	0.39	0.50	0.43	0.41	0.148	0.019	0.37	0.015
Median	67.00	1.00	0.00	0.50	0.41	0.36	0.162	0.017	0.33	0.016
Std dev	6.78	0.51	0.50	0.51	0.13	0.20	0.086	0.008	0.17	0.004

Table 9. Determinants of portfolio performance

The dependent variable in all regressions is the insider portfolio's α in the country estimated in the 2008-2012 window. In Panel A of the table, the regressions include one explanatory variable of interest. In Panel B, the regressions include all explanatory variables which are significant at the 10% level or better for the given transaction type and holding horizon in one-variable regressions reported in Panel A. *MAD Supervisory Powers* measures the existence of powers available to local authorities associated with the translation of 86 specific Market Abuse Directive rules into local laws (source: Christensen et al., 2016). *MAD Action Taken* is a dummy equal to one if the authorities in a given country took at least one enforcement action against violation of MAD rules by 2009. It is equal to zero otherwise (source: Christensen et al., 2016). *Closed Periods* is a dummy variable equal to one if there are either closed periods in which insiders are not allowed to trade introduced at the country level or when firms are required to adopt closed periods at the firm level. The variable is equal to zero otherwise. *Accelerated Trade Reporting* is a dummy variable equal to one if the trade reporting deadline is shorter than five working days mandated by the E.U. directives, even for a subset of trades. The dummy is equal to zero otherwise. Both *Closed Periods* and *Accelerated Trade Reporting* are defined based on the information in Table 1. *Ownership Concentration* is the mean combined ownership stake of 3 largest shareholders across 10 largest publically listed firms in the country (source: LaPorta et al., 1998). *Anti-Self-Dealing Index* measures the protection of minority shareholders in the country against expropriation by management and controlling shareholders (source: Djankov et al., 2008). *Equity Compensation* is the mean ratio of equity-linked pay to total CEO pay in the country (source: Fernandes at al., 2013). *Innovativeness* is the gross domestic spending on Research and Development (R&D) as a percentage of the Gross Domestic Product (GDP) (source: OECD). *Religiosity* is the percentage of survey respondents in the country who answered that religion is an important part of their daily life (source: Gallup). *Trading Costs* is the average percent effective spreads for all trades in a random sample of 30 stocks per country (source: Fong et al., 2017). The constant is included in all regressions but not reported. p-values based on robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Purchases				Sales			
	20 days	65 days	130 days	260 days	20 days	65 days	130 days	260 days
Panel A. Regressions with one variable of interest								
MAD Supervisory Powers	0.0006	0.0006*	0.0003	0.0004	0.0006*	0.0001	0.0001	0.0006*
	(0.353)	(0.054)	(0.327)	(0.107)	(0.089)	(0.703)	(0.719)	(0.074)
Adjusted R-sq	0.005	0.137	-0.016	0.104	0.100	-0.058	-0.059	0.230
MAD Action Taken	-0.0004	-0.0053	-0.0034	0.0028	-0.0043	-0.0014	0.0083	0.0093**
	(0.954)	(0.261)	(0.480)	(0.466)	(0.428)	(0.766)	(0.190)	(0.022)
Adjusted R-sq	-0.066	0.013	-0.031	-0.018	-0.017	-0.059	0.062	0.282
Closed Periods	0.0000	-0.0010	0.0040	0.0021	0.0042	0.0019	0.0068	-0.0027
	(1.000)	(0.837)	(0.404)	(0.492)	(0.421)	(0.620)	(0.287)	(0.506)
Adjusted R-sq	-0.0623	-0.060	-0.013	-0.033	-0.017	-0.0489	0.026	-0.033

(continued)

Table 9. - *continued*

	Purchases				Sales			
	20 days	65 days	130 days	260 days	20 days	65 days	130 days	260 days
Panel A. - continued								
Accelerated Trade Reporting	-0.0006	-0.0035	-0.0101**	-0.0041	-0.0019	-0.0015	-0.0048	-0.0016
	(0.930)	(0.484)	(0.017)	(0.183)	(0.711)	(0.720)	(0.408)	(0.692)
Adjusted R-sq	-0.062	-0.030	-0.010	0.052	-0.053	-0.0534	-0.017	-0.052
Ownership Concentration	-0.0178	-0.0214	-0.0259**	-0.0301*	0.0014	0.0145	-0.0087	-0.0172
	(0.664)	(0.334)	(0.031)	(0.055)	(0.939)	(0.344)	(0.675)	(0.153)
Adjusted R-sq	-0.066	0.001	0.098	0.247	-0.0901	-0.035	-0.074	0.027
Anti-Self-Dealing Index	0.0441***	0.0261***	0.0256**	0.0110	0.0137	0.0062	0.0127	0.0033
	(0.001)	(0.001)	(0.024)	(0.341)	(0.290)	(0.442)	(0.279)	(0.660)
Adjusted R-sq	0. 341	0.189	0.285	0.047	0.004	-0.045	0.011	-0.060
Equity Compensation	0.0314	-0.0076	0.0031	0.0262	0.0355	0.0122	0.0252	0.0130
	(0.598)	(0.837)	(0.912)	(0.249)	(0.193)	(0.583)	(0.280)	(0.570)
Adjusted R-sq	-0.066	-0.095	-0.099	0.055	-0.029	-0.083	-0.026	-0.069
Innovativeness	-0.4681	-0.5048	-0.0838	0.1223	-0.0627	0.1322	-0.0323	-0.1930
	(0.213)	(0.125)	(0.737)	(0.639)	(0.804)	(0.592)	(0.917)	(0.599)
Adjusted R-sq	0.000	0.087	-0.062	-0.044	-0.064	-0.047	-0.066	-0.030
Religiosity	0.0200	-0.0130	-0.0246**	-0.0151	0.0156	0.0120	-0.0112	-0.0010
	(0.359)	(0.343)	(0.024)	(0.173)	(0.350)	(0.223)	(0.568)	(0.933)
Adjusted R-sq	-0.007	-0.014	0.178	0.095	0.004	-0.005	-0.040	-0.066
Trading Costs	1.8971***	0.8961*	0.7608*	0.7146	-0.2873	-0.0711	-0.2613	0.1298
	(0.001)	(0.091)	(0.069)	(0.149)	(0.733)	(0.905)	(0.674)	(0.808)
Adjusted R-sq	0.205	0.075	0.077	0.106	-0.079	-0.090	-0.075	-0.084

(continued)

Table 9. - *continued*

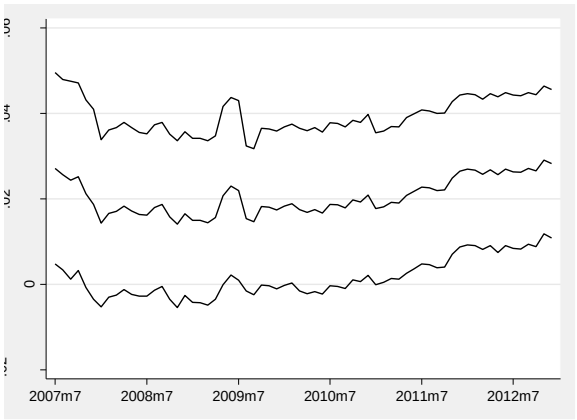
	Purchases				Sales			
	20 days	65 days	130 days	260 days	20 days	65 days	130 days	260 days
Panel B. Regressions with multiple variables of interest								
MAD Supervisory Powers		-0.0002						0.0005*
		(0.541)						(0.086)
MAD Action Taken								0.0076**
								(0.025)
Accelerated Trade Reporting			-0.0059***					
			(0.010)					
Ownership Concentration			0.0233*					
			(0.059)					
Anti-Self-Dealing Index	0.0398***	0.0310***	0.0298***					
	(0.000)	(0.002)	(0.000)					
Religiosity			-0.0197**					
			(0.030)					
Trading Costs	1.8761***	0.8765*	0.7025**					
	(0.005)	(0.066)	(0.028)					
Adjusted R-sq	0.529	0.548	0.852					0.414

Figure 1. α's of insider portfolios over time

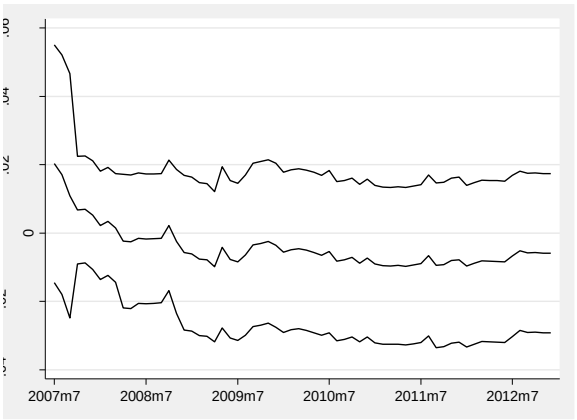
The figure presents Jensen's α's (middle line) of insider portfolios and their 95% confidence intervals estimated in rolling windows of 60 months. α's are estimated from the CAPM model presented in equation (1). The portfolios consist of all shares purchased or sold by insiders in a given country in open market transactions and held for 20 trading days. Dates on the horizontal axis indicate the last date of the respective rolling window. Details of the sample are presented in Table 2.

Panel A. Germany

Purchases

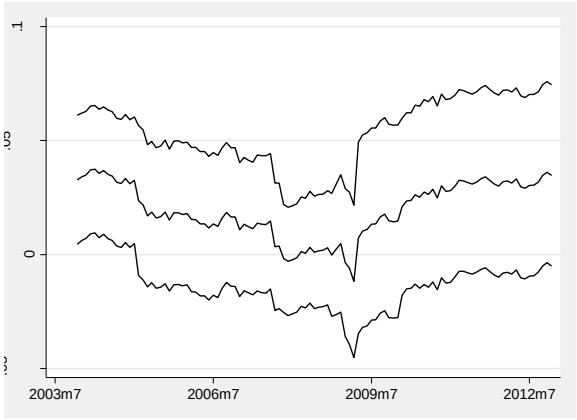


Sales



Panel B. Ireland

Purchases



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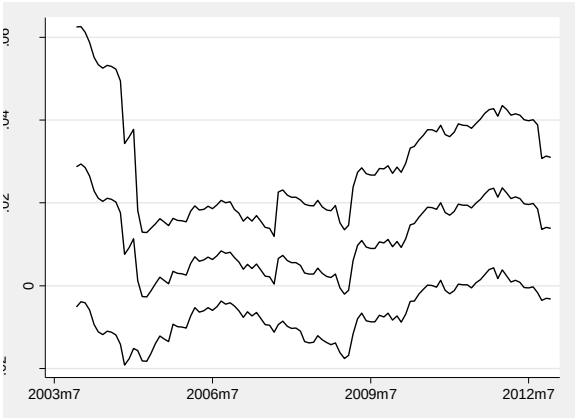
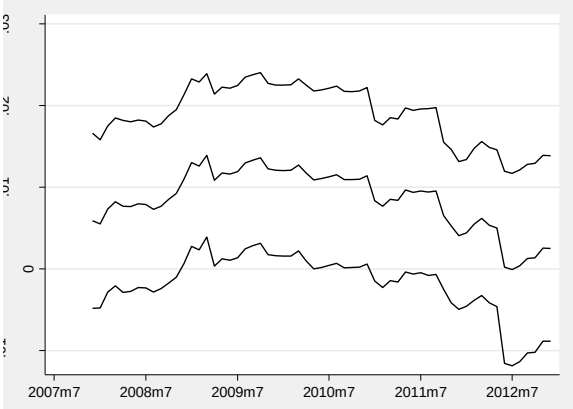


(continued)

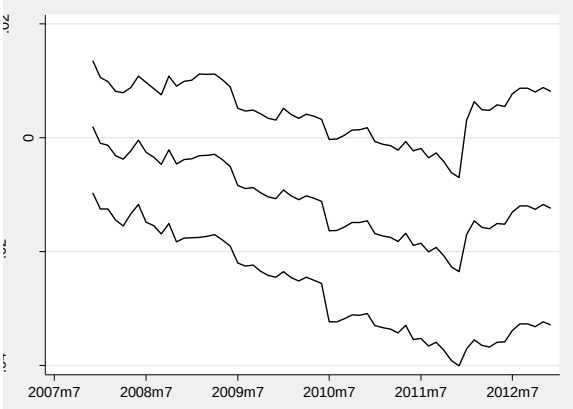
Figure 1. - *continued*

Panel C. Italy

Purchases

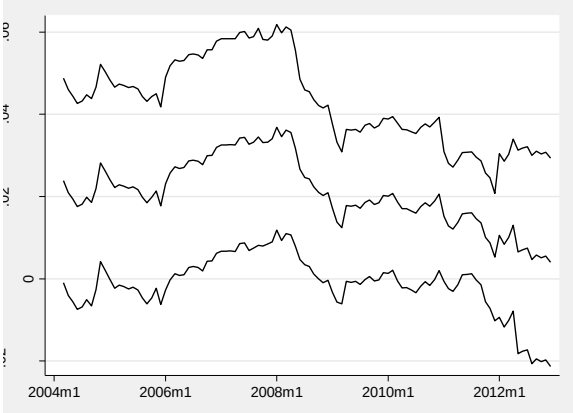


Sales



Panel D. Netherlands

Purchases



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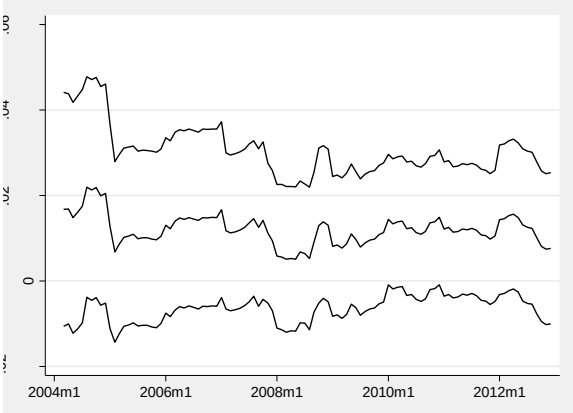
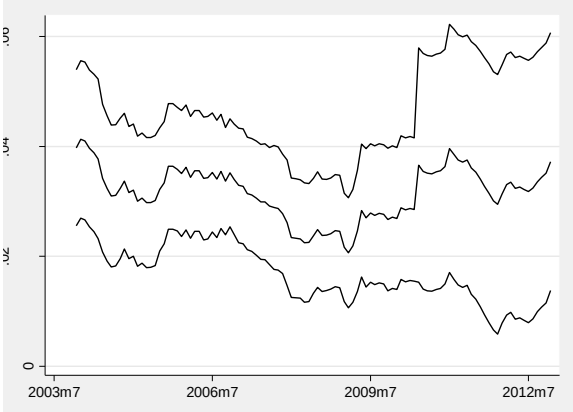


Panel E. U.K.

Purchases



Sales